"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

ACC NR: AP7002689 SOURCE CODE: UR/0424/66/000/006/0034/0036

AUTHOR: Lyashenko, V. F. (Moscow)

ORG: none

TITLE: On the sufficient stability conditions of monogyroscopic systems

SOURCE: Inzhenernyy zhurnal. Mekhanika tverdogo tela, no. 6, 1966, 34-36

TOPIC TAGS: gyroscope, gyroscope motion equation, motion stability

ABSTRACT: The Lyapunov stability of motion of a solid heavy body with one fixed point was analyzed; the point is moving over the earth's surface. The gyroscope is inside the body. A Lyapunov function providing sufficient stability conditions for the nonexcited motion of the system was constructed. The specific cases considered involved various positions of the center of gravity, both for a gyropendulum and for a gyrocompass. The ultimately developed generalized conditions of stability are

$$(A_2 + B_2 - A_1 - B_1)\,\Omega_1 + B_2\alpha_{40}' > 0$$
$$(A_2 + B_2 - A_3 - B_1)\,\Omega_1 + B_2\alpha_{40}' > 0$$

Here, A_1, A_2, A_3 are main moments of inertia of the body with respect to the axes y_1,

Card 1/2

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

ACC NR: AP7002689

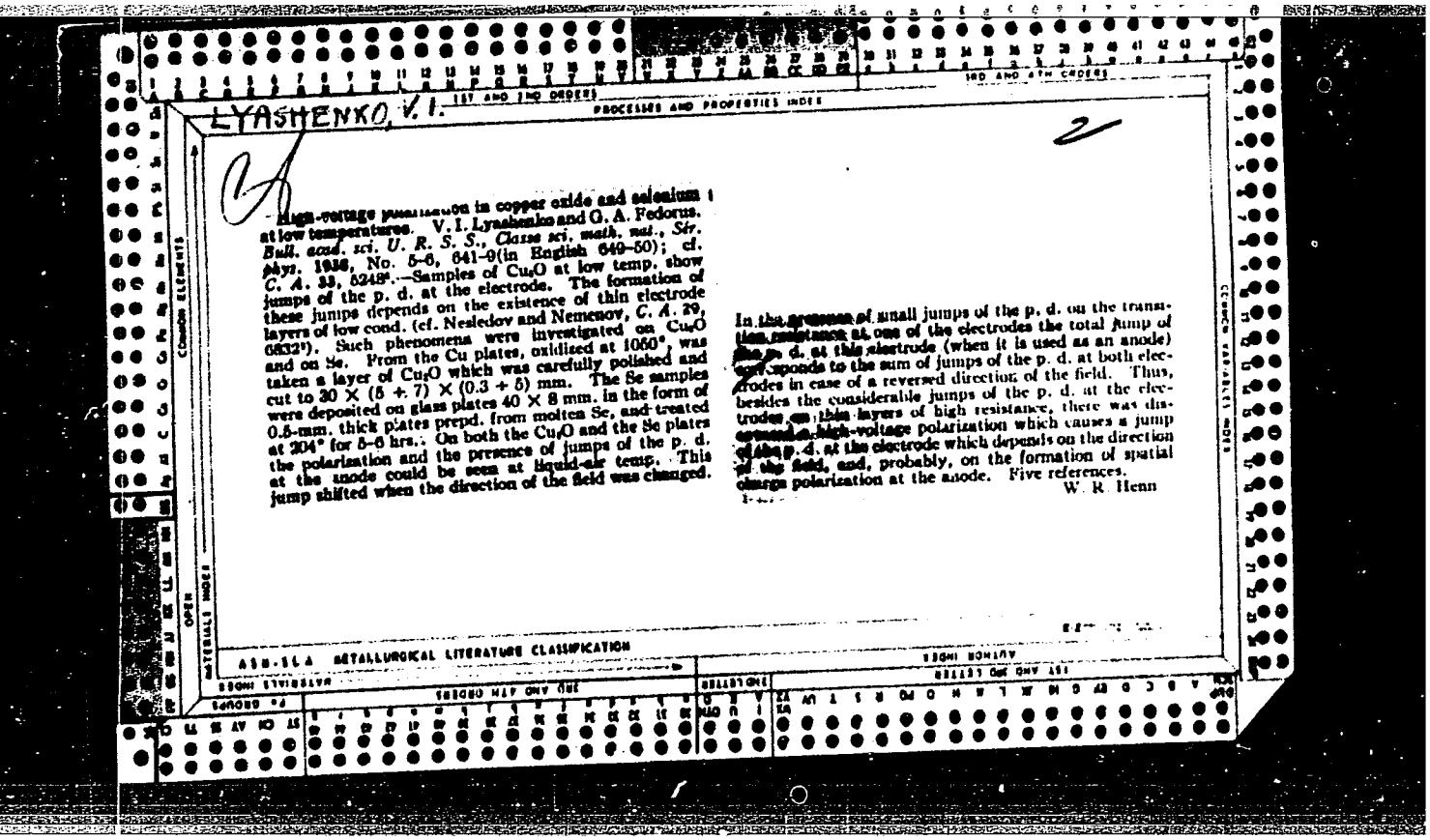
y_2, y_3; B_1, B_2 are main moments of the inertia of the rotor with respect to axes y_1, or y_3; Ω is the angular velocity of the trihedron x_1, x_2, x_3 with respect to axis x_3; α is the angle of rotation. Orig. art. has: 20 formulas.

SUB CODE: 17,13/ SUBM DATE: 16Dec65/ ORIG REF: 003

Card 2/2

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8



LYASHENKO, V. I.

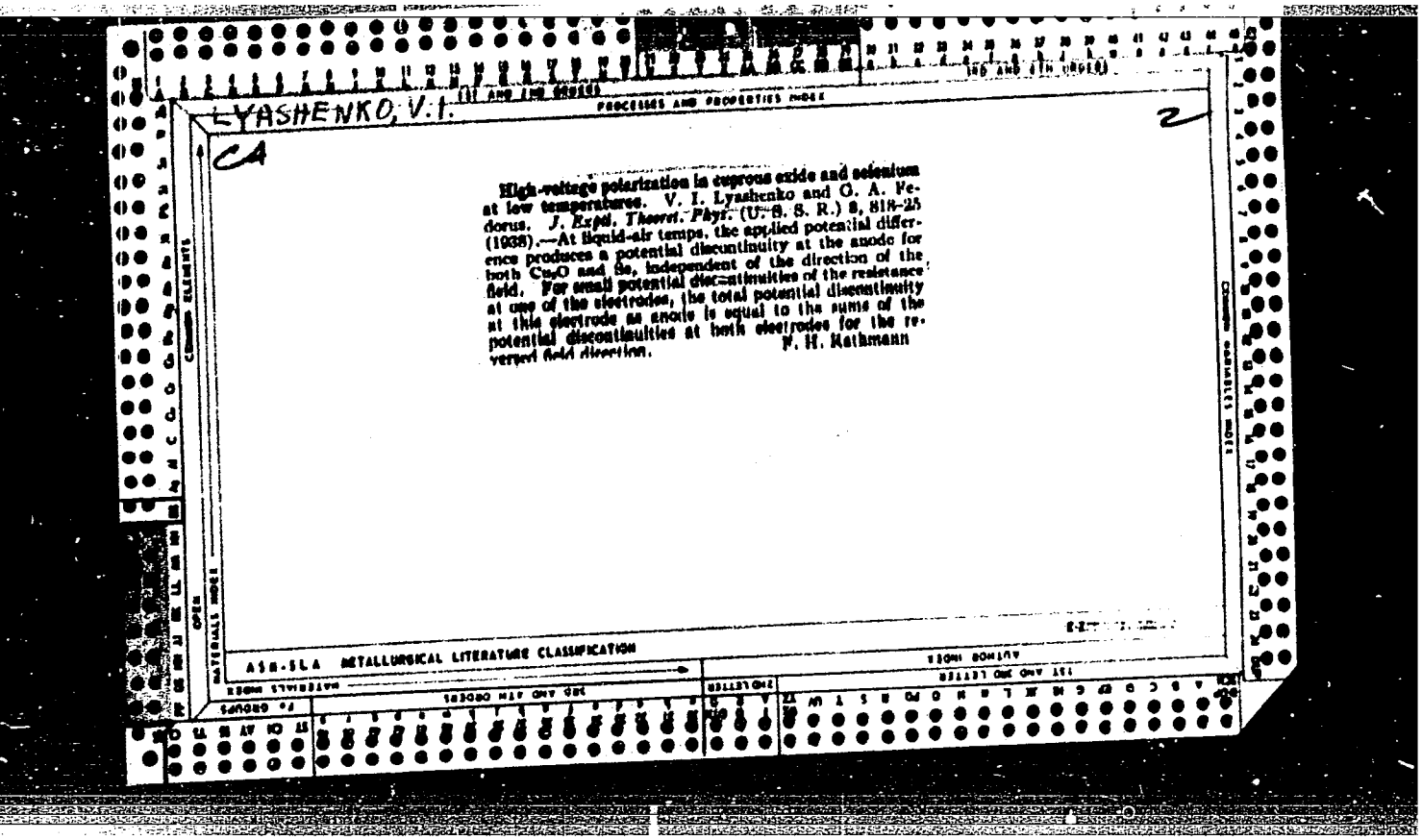
2

High-voltage polarization in copper oxide and selenium at low temperatures. V. I. Lyashenko and O. A. Fedorus. *Bull. acad. sci. U. R. S. S., Classe sci. math. nat., Sér. phys.* 1938, No. 5-6, 641-9(in English 649-50); cf. *C. A.* 33, 5248⁸.—Samples of Cu_2O at low temp. show jumps of the p. d. at the electrode. The formation of these jumps depends on the existence of thin electrode layers of low cond. (cf. Nesledov and Nemenov, *C. A.* 29, 6832²). Such phenomena were investigated on Cu_2O and on Se. From the Cu plates, oxidized at 1050°, was taken a layer of Cu_2O which was carefully polished and cut to 30 × (5 + 7) × (0.3 + 5) mm. The Se samples were deposited on glass plates 40 × 8 mm. in the form of 0.5-mm. thick plates prepd. from molten Se, and treated at 204° for 5–6 hrs. On both the Cu_2O and the Se plates the polarization and the presence of jumps of the p. d. at the anode could be seen at liquid-air temp. This jump shifted when the direction of the field was changed. In the presence of small jumps of the p. d. on the transition resistance at one of the electrodes the total jump of the p. d. at this electrode (when it is used as an anode) corresponds to the sum of jumps of the p. d. at both electrodes in case of a reversed direction of the field. Thus, besides the considerable jumps of the p. d. at the electrodes on thin layers of high resistance, there was discovered a high-voltage polarization which causes a jump of the p. d. at the electrode which depends on the direction of the field, and, probably, on the formation of spatial charge polarization at the anode. Five references.

W. R. Henn

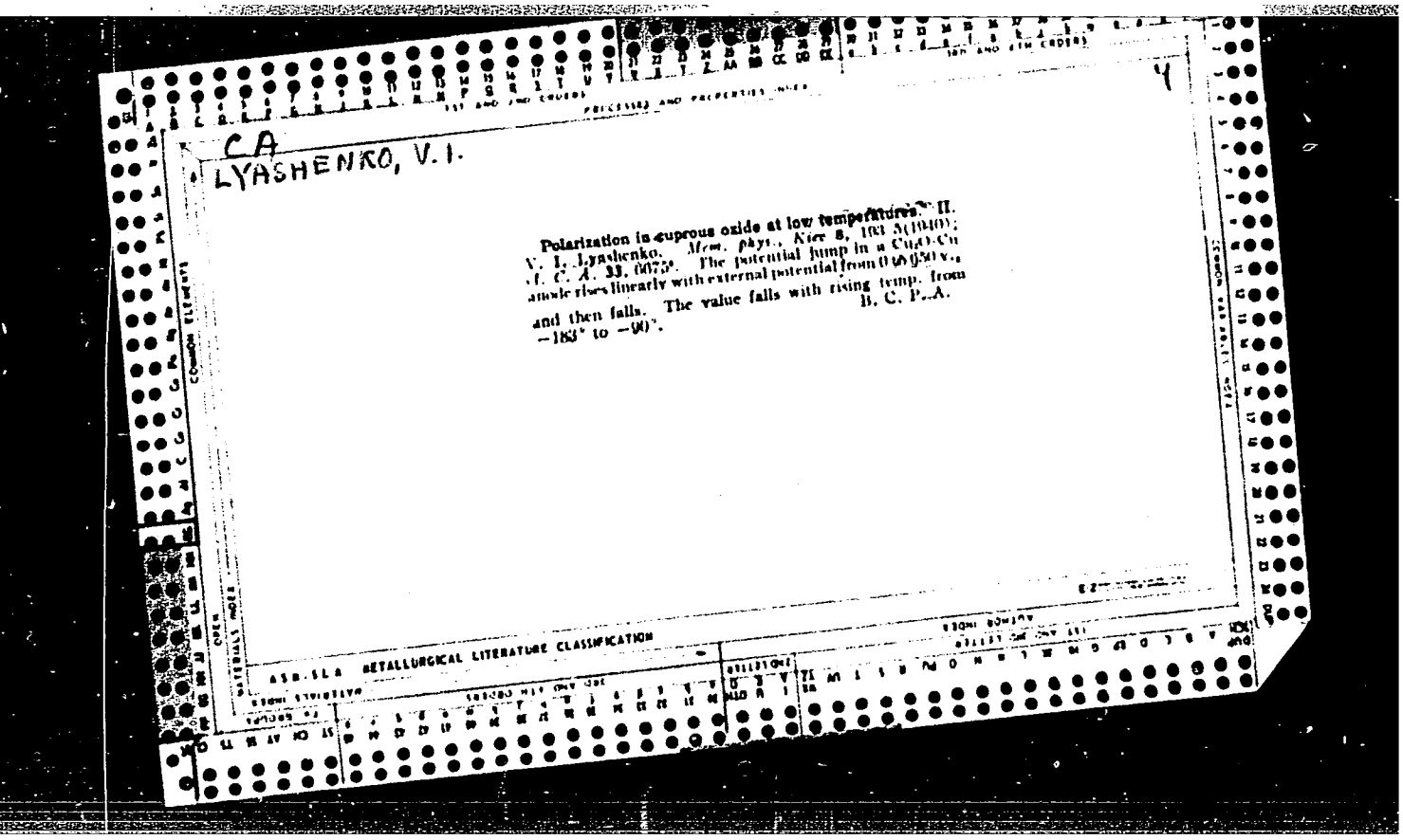
APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8



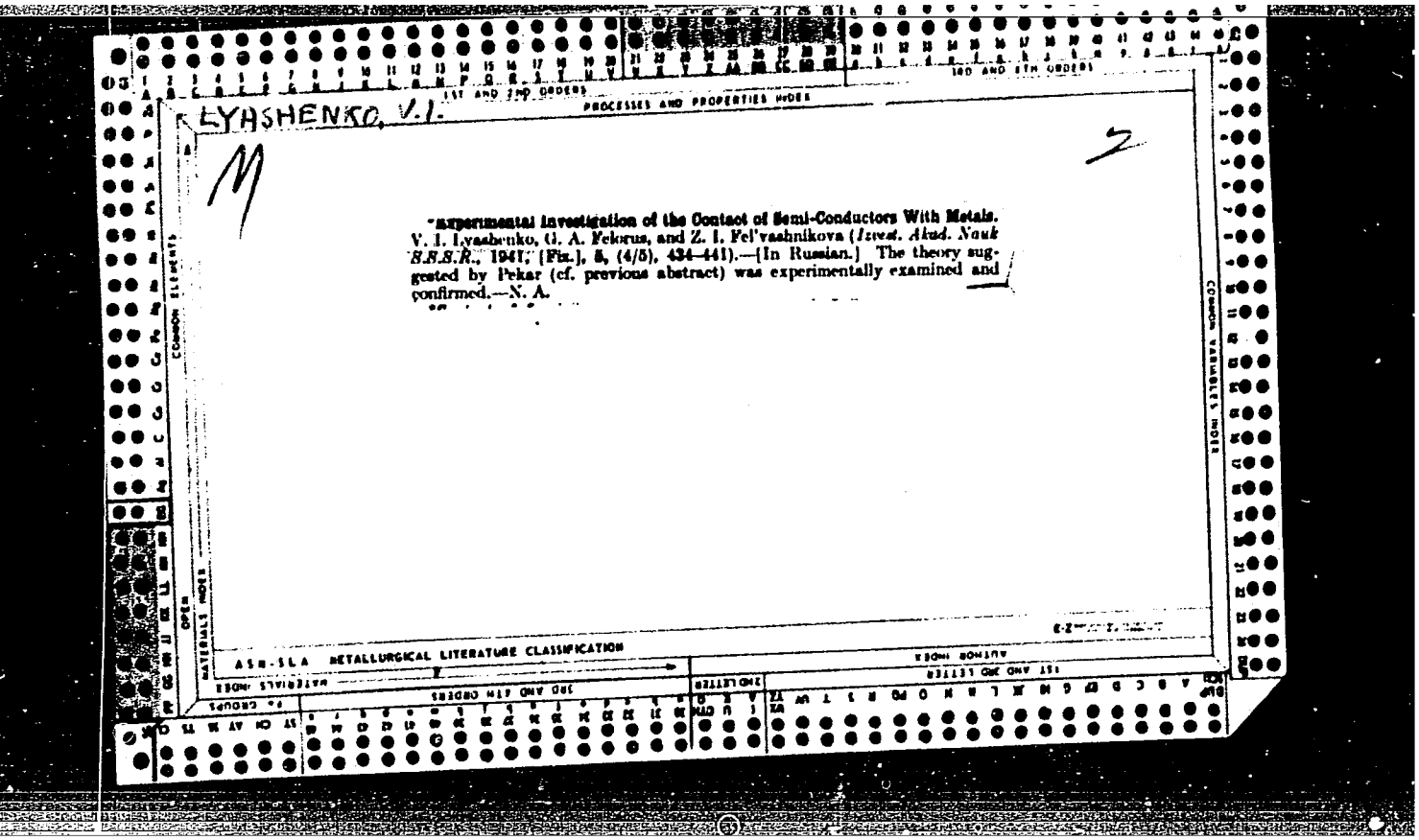
APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8



APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8



LYASHENKO, V.I.

M

2

"Experimental Investigation of the Contact of Semi-Conductors With Metals. V. I. Lyashenko, G. A. Fedorus, and Z. I. Fel'vashnikova (*Izvest. Akad. Nauk S.S.S.R.*, 1941, [Fiz.], 5, (4/5), 434–441).—[In Russian.] The theory suggested by Pekar (cf. previous abstract) was experimentally examined and confirmed.—N. A.

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V. I.

The phenomenon of enrichment of a semiconductor with current carriers under the action of the contact field. V. I. Lyashenko and A. M. Pavlenko. *Zhur. Tekh. Fiz.* 17, 1097–1104(1947).—The elec. resistance R of Cu_2O with an electrode of Au-plated Sn foil applied by pressure decreases with increasing pressure, and tends toward a limit. However, even at the limit, R is still about 10 times greater than that of a sample with a film electrode made by evapn. of Au *in vacuo* and condensation on the Cu_2O. An electrode applied by pressure evidently ensures contact only at discrete points. In the case of a hole conductor such as Cu_2O, an enrichment of the surface in current carriers, i.e. in holes, was to be expected through contact with an electrode with a pos. contact potential difference with respect to Cu_2O. This was realized by a Pt electrode treated anodically in dil. H_2SO_4, and showing, after that treatment, a contact potential difference relative to Cu_2O of +0.96 to +1.08 v. Such specimens had a considerably lower R than specimens with Au electrodes or with electrodes of untreated Pt. With Pt treated cathodically, and showing a neg. contact potential difference towards Cu_2O, R was increased. N. Thon

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHCHENKO, V.I.; SKUBENKO, A.F.

Measuring the Hall effect at liquid oxygen temperatures. Nauk. zap. Kiev. un. 9 no.2:17-20 '50. (MLRA 9:12)

(Hall effect) (Low temperature research)

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

M LYASHENKO, V. I.

1

Dependence of the Contact Resistance Between a Metal and a Semi-Conductor on the Contact Potential Difference. V. I. Lyashenko and A. M. Pavlenko (*ZAur. Tekhn. Fiziki*, 1950, **20**, (7), 854–857; *Physics Abs.*, 1951, **54**, 211).—When the contact resistance between Cu_2O and metal electrodes was investigated, approx. agreement with Davidenkov's law was found only when the contact p.d. between the metal and semi-conductor was small; at larger p.d. discrepancies were found. This prompted L. and P. to carry out specially careful investigations of the true relation with films of different metals on Pt surface electrodes, and to exclude effects of surface configuration by testing each particular metal in the form of a foil (always under exactly the same pressure) in three surface modifications: (*a*) bright, unetched; (*b*) etched with HNO_3; and (*c*) polished with fine glass-paper. Results are given in graphical form.

Сдан. 1952

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V.I.

USSR/Physics - Semiconductors, Thin-Laminar Mar/Apr 52

"Effect of Volume Charges on Conductivity of Thin Layers of Semiconductors and Metals," M. S. Kosman

"Iz Ak Nauk, Ser Fiz" Vol XVI, NO 2, p 202

Abbreviated text of report published in "Zhur Eksper i Teoret Fiz" 21, 528, 1951. Tested layers were laid on both sides of insulating plate. The sign of effect on semiconductor Te agrees with theory by V. Ye Lashkarev and with expts by V. I. Lyashenko and I. I. Stepko. Graphite, Sb, Bi and Pb showed on opposite sign of effect, besides the resistance of one of electrodes passed through a max with increasing field. The behavior of the resistance depends on the presence of initial charge.

PA 220T93

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V. I.

USSR/Physics - Semiconductors, Work Function Mar/ Apr 52

"Work Function and Conductivity of Semiconductors in Presence of a Surface Charge," V. Ye. Lashkarev, Kiev State U and Inst of Phys, Acad Sci Ukrainian SSSR

"Iz Ak Nauk, Ser Fiz" Vol XVI, No 2, pp 203-210

Studies effect of surface charge (conception 1st developed by I. Ye Tamm, Sow. Phys, 1, 733, 1932; "Zhur Eksper i Teoret Fiz" 3, 34, 1933) on work function of a semiconductor. Derives corresponding eqs, showing theoretically that in thin samples the distribution of current carriers is homogeneous. While in thick or "quasi-thick" layers the surface charges do not produce mutual effect. Exptl research by V. I. Lyashenko (cf. "Zhur Tekh Fiz" Vol XVI, No 2, 211, 1952) is in agreement with this theory.

PA 220T94

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

USSR/Physics - Semiconductors, Surface Charges — Mar/Apr 52

"Influence of Adsorption on the Surface Charges and Conductivity of a Semiconductor," V.I. Lyashenko, I.I. Stepko, Inst of Phys, Acad Sci Ukrainian SSR

"Iz Ak Nauk, Ser Fiz", Vol XVI, No 2, pp 211-217

Exptl research methods of the institute are described by V.Ye. Lashkarev and V.I. Lyashenko in "Jubilee Edition Devoted to 70th Birthday of Academician A.F. Ioffe," 1950. Current article describes study of variation of work function under the influence of various actions on semiconductor; variation of conductivity of thin layer; and study of screening by superficial charges. Indebted to V. Ye. Lashkarev.

220T95

LYASHENKO, V. I.

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V. I.

USSR/Physics - Semiconductors, Potential Surge — Mar/Apr 52

"Investigating the Temperature Dependence of a Potential Jump (Surge) at the Electrode in Cuprous Oxide," G.M. Abdullayev, Inst of Phys and Math, Acad Sci Azerbaydzhan SSR

"Iz Ak Nauk, Ser Fiz" Vol XVI, No 2, pp 225,226

Exptl research of high-tension polarization in hole semiconductors, cuprous oxide and selenium, at temp of liquid air was performed by V.I. Lyashenko, G.A. Gedorurus and Z.P. Felvashnikova ("Iz Ak Nauk Ser Fiz" 5, 641, 1938; 5, 4-5 1941); they found a potential surge at the anode. Author studied this phenomenon at room temp in various elec fields. He found an increasing surge with decreasing temp. Indebted to Kh. I. Amirkhanov.

22CT97

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, U. I.

USSR

537.312.5

6143. The adsorption of molecules and the photoconductivity of cuprous oxide. U. I. LYASHENKO. *Dokl. Akad. Nauk SSSR*, 87, No. 1, 33–5 (1952) In Russian.

The adsorption of acetone and ethyl alcohol from the vapour phase was used to alter reversibly the electronic state of the surface of thin (1 μ) or thick (0·2 mm) specimens of the semiconductor. Photoconductivity was excited with light pulses of 3 msec separated by 115 msec intervals, and the decay curve was observed on a c.r.o. Two time constants τ_1 ($\sim 10^{-4}$ sec) and τ_2 (10^{-3} sec) are observed. τ_1 changes from $2{\cdot}2\times10^{-4}$ sec (vacuum 10^{-4} mm) to $5{\cdot}7\times10^{-4}$ sec (saturated vapour) and the photoconductivity associated with τ_1 decreases more rapidly in vapour than that for τ_2. The dark resistance increases in the vapour. The empirical relationship $\tau_1 = \tau_0(R_0/R)^n$ where $n = 1{\cdot}3$ is obtained. The peak value of the photocurrent is plotted as a function of pressure for atmospheres of acetone, alcohol and benzene. Similar results are obtained for thick and thin specimens. The results are said to agree with the original hypothesis that the adsorbed molecules give rise to changes in the number of surface states suitable for trapping photoelectrons. W. BARDSLEY

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V. I.

3

USSR

Change in the work function and conductivity of molybdenum sulfide under the influence of adsorption. Lyashenko. *Trudy Inst. Fiz., Akad. Nauk Ukr. S.S.R.* 4, [illegible] cf. *C.A.* 46, 10018e.—In order to det. the effect of the polycryst. nature of earlier samples, the work function and cond. of monocryst. MoS_2 were detd. and the change in these values with the adsorption of H_2O, acetone, and C_6H_6 vapors. The results showed that, as for polycryst. samples, a change occurred in the work function and elec. cond. of monocryst. MoS_2 that is caused by a change in the surface charge.

J. Rovtar Leach

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V.I.; SNITKO, O.V.

Effect of molecular absorption on the photoconductivity of semiconductors. Trudy Inst.fiz. AN URSR no.5:65-76 '54. (MLRA 7:12)
(Molecular dynamics) (Photoconductivity) (Semiconductors)

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V.I.; SNITKO, O.V.; SEMENYUCHENKO, I.M.

Effect of molecular absorption on the photoconductivity of semiconductors. Part 2. Kinetics and mechanism of phenomena occurring in copper oxide. Trudy Inst.fiz. AN URSR no.5: 77-86 '54. (MLRA 7:12)
(Molecular dynamics) (Photoconductivity) (Semiconductors) (Copper oxide)

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHCHENKO, V. I.

AF701597 TREASURE ISLAND BOOK REVIEW AID 801 - S

~~V. I.~~ LYASHCHENKO (Institute of Physics, Academy of Sciences of Ukraine SSR)

DISKUSSIYA (Discussion). In Problemy kinetiki i kataliza (Problems of Kinetics and Catalysis), vol. 8. Izdatel'stvo Akademii Nauk SSSR, 1955. Section I: Effect of illumination on the adsorbability of solids. p. 71.

The study of Cu_2O, Sb_2S_3, Bi_2S_3, PbO, PbS, ZnO, SnS, and CdS showed that adsorption affects the photoconductivity. It was found that the life of the electron on the surface of Cu_2O is 10^{-4} sec., and in the space 10^{-2} sec. Adsorption of alcohol vapors greatly increases the electron life on the surface, but only slightly affects its life in the space.

1/1

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

AF701597 TREASURE ISLAND BOOK REVIEW AID 830 - S

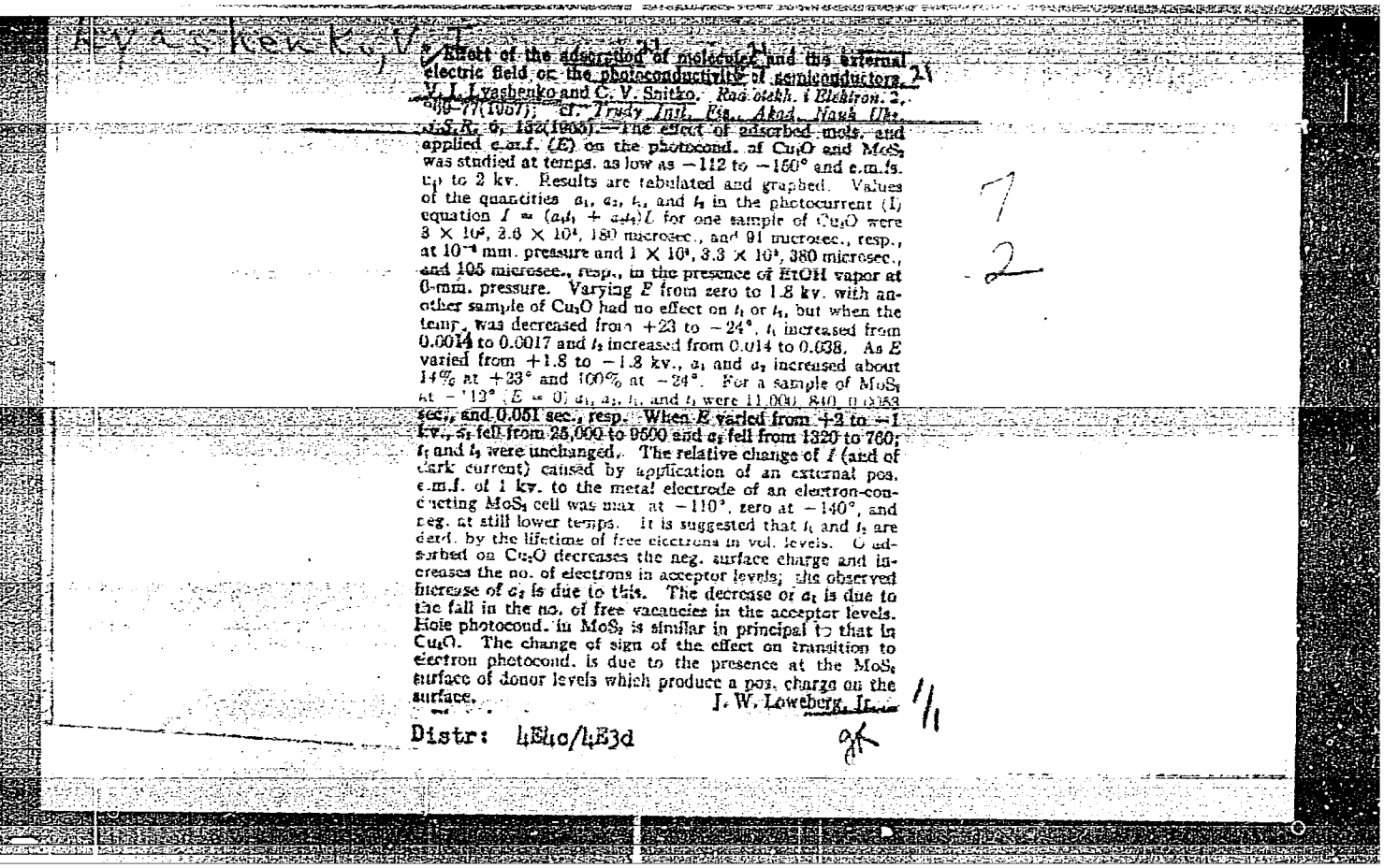
LYASHENKO, V. I. (Institute of Physics, Academy of Sciences, Ukraine SSR).
DISKUSSIYA (Discussion). In Problemy kinetiki i kataliza (Problems of Kinetics and Catalysis), vol. 8. Izdatel'stvo Akademii Nauk SSSR, 1955. Section III: Connection between the electric conductivity and catalytic activity of semiconductors. p. 205.

Lyashenko accepts V. L. Bonch-Bruyevich's explanation that increase in the diffusion of oxygen is due to local overheating. He adds that another cause for the increase in the diffusion of O_2 is the formation of atomic oxygen on the surface of CuO during the catalytic reaction. Another assumption may be made, namely: that the catalytic reaction proceeds to some extent at the expense of oxygen contained in the sample. This would transform the hole-rich CuO into an electronic CuO.

1/1

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8



Effect of the adsorption of molecules and the external electric field on the photoconductivity of semiconductors. V. I. Lyashenko and C. V. Snitko. *Radiotekh. i Elektron.* 2, 966–77 (1957); cf. *Trudy Inst. Fiz., Akad. Nauk Ukr. S.S.R.* 6, 182 (1956). The effect of adsorbed mols. and applied e.m.f. (E) on the photocond. of Cu_2O and MoS_2 was studied at temps. as low as −112 to −160° and e.m.fs. up to 2 kv. Results are tabulated and graphed. Values of the quantities a_1, a_2, t_1, and t_2 in the photocurrent (I) equation $I = (a_1t_1 + a_2t_2)L$ for one sample of Cu_2O were 3×10^2, 2.6×10^4, 180 microsec., and 91 microsec., resp., at 10^{-4} mm. pressure and 1×10^3, 3.3×10^3, 380 microsec., and 105 microsec., resp., in the presence of EtOH vapor at 0-mm. pressure. Varying E from zero to 1.8 kv. with another sample of Cu_2O had no effect on t_1 or t_2, but when the temp. was decreased from +23 to −24°, t_1 increased from 0.0014 to 0.0017 and t_2 increased from 0.014 to 0.038. As E varied from +1.8 to −1.8 kv., a_1 and a_2 increased about 14% at +23° and 100% at −24°. For a sample of MoS_2 at −112° ($E = 0$) a_1, a_2, t_1, and t_2 were 11,000, 840, 0.0053 sec., and 0.051 sec., resp. When E varied from +2 to −1 kv., a_1 fell from 25,000 to 9600 and a_2 fell from 1320 to 760; t_1 and t_2 were unchanged. The relative change of I (and of dark current) caused by application of an external pos. e.m.f. of 1 kv. to the metal electrode of an electron-conducting MoS_2 cell was max. at −110°, zero at −140°, and neg. at still lower temps. It is suggested that t_1 and t_2 are detd. by the lifetime of free electrons in vol. levels. O adsorbed on Cu_2O decreases the neg. surface charge and increases the no. of electrons in acceptor levels; the observed increase of a_2 is due to this. The decrease of a_1 is due to the fall in the no. of free vacancies in the acceptor levels. Hole photocond. in MoS_2 is similar in principal to that in Cu_2O. The change of sign of the effect on transition to electron photocond. is due to the presence at the MoS_2 surface of donor levels which produce a pos. charge on the surface.

J. W. Loweberg, Jr.

Distr: 4E4c/4E3d

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V.I.

Effect of molecular adsorption on the photoconductivity of semiconductors. Part 4. Nonlinear photoconductivity of cuprous oxide. Trudy Inst.fiz.AN URSR no.6:141-147 '55. (MLRA 9:8)
(Copper oxides--Electric properties)

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V.I.

VOL'KENSHTEYN, F.F.; KURBATOV, L.N.; LYASHENKO, V.I.; KISELEV, A.V.
VOYEVODSKIY, V.V.; ROGINSKIY, S.Z.; TERENIN, A.N.

Discussion. Probl.kin.i kat. 8:68-76 '55. (MLRA 9:5)

1. Institut fizicheskoy khimii AN SSSR (for Vol'kenshteyn, Kiselev, Roginskiy); 2. Voyenno-morskaya meditsinskaya akademiya Leningrad (for Kurbatov); 3. Institut fiziki AN SSSR (for Lyashenko); 4. Institut khimicheskoy fiziki AN SSSR (for Voyevodskiy); 5. Leningradskiy gosudarstvennyy universitet (for Terenin).
(Photochemistry) (Desorption) (Semiconductors)

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

Lyashenko, V. I.

The change of the work function and the conductivity of copper oxide in catalytic reactions. V. I. Lyashenko and I. I. Stepko. *Problemy Kinetiki i Kataliza, Akad. Nauk S.S.S.R.* 8, 180-8(1955); cf. *C.A.* 46, 10918c.—The change of the cond. and of the work function was measured (app. illustrated) on thin layers of CuO under the influence of temp. and during the adsorption of CO_2, CO, and O_2 and mixts. thereof, under the conditions of a catalytic reaction, i.e. the temps. varied from 20 to 225°. This is a new method of investigating catalytic reactions, without disturbing the course of the reaction of interest. As soon as starting catalytic temps. (80°) are reached, (1) the curve of temp. *vs.* work function drops rapidly, and (2) the straight-line relation log I vs. $1/T$ breaks off. As chem. analysis of the gases shows, below this temp. there is no reaction; at higher temps. more and more CO_2 is formed. Unreactive specimens of CuO that, according to the gas analysis, did not act catalytically, do not show these 2 phenomena, in spite of the fact that they were kept under the same conditions. The occurrence of these 2 phenomena is linked to the start of catalytic activity; the presence of CO_2 has no effect.

Werner Jacobson

(1)

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

BONCH-BRUYEVICH, V.L.; YELOVICH, S.Yu.; ROGINSKIY, S.Z.; VOL'KENSHTEYN, F.F.; MATVEYEV, K.I.; PSHEZHETSKIY, S.Ya.; LYASHENKO, V.I.

Discussion. Probl.kin.i kat. 8:198-205 '55. (MLRA 9:5)

1. Moskovskiy elektrotekhnicheskiy institut svyazi (for Bonch-Bruyevich); 2. Institut fizicheskoy khimii AN SSSR (for Yelovich, Roginskiy, Vol'kenshteyn); 3. Fiziko-khimicheskiy institut imeni L.Ya. Karpova (for Matveyev, Pshezhetskiy); 4. Institut fiziki AN Ussr (for Lyashenko).
(Catalysis) (Electrons)

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO,V.I.; STEPKO,I.I.

Variations in the yield and conductivity of cupric oxide during catalytic reactions. Zhur.fiz.khim. 29 no.3:401-408 Mr. '55. (MLRA 8:7)

1. Akademiya nauk Ukrainskoy SSR, Institut fiziki, Kiyev.
(Copper oxides) (Catalysis)

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

Name: LYASHCHENKO, Vasiliy Ivanovich

Dissertation: The influence of surfaces on electrical phenomena in semiconductors

Degree: Doc Phys-Math Sci

Affiliation: Inst of Physics Acad Sci UkSSR

Defense Date, Place: 9 Jun 56, Joint Council of Insts of Mathematics and Physics, Acad Sci UkSSR

Certification Date: 9 Mar 57

Source: BMVO 13/57

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V.I.; LITVINOV, R.O.

Changes in the electric conductivity of germanium subjected to external electric fields. Ukr. fiz. zhur. 1 no.2:143-150 Ap-Je '56. (MIRA 9:11)

1. Institut fiziki Akademii nauk URSR.
(Germanium--Electric properties)

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V. I.

2

The influence of illumination on the modulation of the conductivity of semiconductors in an external electric field. V. I. Lyashenko and N. S. Chorna. *Doposidi Akad. Nauk. Ukr. R.S.R.* 1956, No. 4, 334–5(Russian summary).—The modulation of the cond. of Te by an external elec. field changes upon illumination. This illumination causes an increase of the vol. concn. of the current carriers (n_e) as well as an increase of the occupation of the surface levels (ΔN), and this latter increase enhances the shielding of the external elec. field. A formula is given for the change of the modulation of the cond. which shows that an increase of n_e and ΔN will lead to a decrease of this modulation. W. J.

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYTSENKO, V.I. LJASENKO, V.I.

SUBJECT USSR / PHYSICS CARD 1 / 2 PA - 1876
AUTHOR LJASENKO,V.I., SYTENKO,T.N.
TITLE The Electric Surface Conductivity of Germanium.
PERIODICAL Žurn.eksp.i teor.fis,31,fasc.5,905-907 (1956)
Issued: 1 / 1957

Here the exterior electric field was used as a medium for the reversible modification of the surface charge. A monocrystalline Germanium plate (with soldered-on contacts for measuring the Hall effect and conductivity) was pasted onto thin mica foils (30 to 50μ) by means of polysterol varnish. A metal plate was pasted onto the reversed side of the mica foil. The Hall effect and conductivity were measured in the presence of an electric field(at + V and at - V on the metal plate) and also without such a field. From the results of these measurements the effective value of the mobility u_e was determined. The results of these computations are shown for some samples in a table. Measurements were repeated several times and were found to be absolutely reproducible.
Under the effect of the exterior electric field the resistances of the samples with electronic as well as with own conductivity increased at + V and diminished at - V on the metal plate. Also Hall's electromotoric force V_x and the mobility u_e were measured. At -V on the metal plate they increased and at +V they diminished. If a surface zone of electric conductivity exists, the mobility of the electrons on the surface is lower than in the interior of the sample

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

Zurn.eksp.i teor.fis,31,fasc.5,905-907 (1956) CARD 2 / 2 PA - 1876

The authors also determined the Hall effect and the specific resistance on six samples with different thickness d without the action of an exterior electric field. With a reduction of d, u_e and ϱ diminished; numerical values are given. If the reduction of mobility is due to the scattering of electrons on the surface "traps", an increase of ϱ on the occasion of the reduction of d might be expected. These data indicate the existence of a surface conductivity zone in spite of the existence of scattering on surface charges. For the final clarification of this problem the authors measured the modification of the resistance of the samples in the magnetic field in two positions: 1.) If the samples were vertical ($\Delta \varrho_\perp$) to, and 2.) if they were parallel ($\Delta \varrho_\parallel$) with the magnetic field. Measurements carried out on ten samples resulted in $\Delta \varrho_\perp > \Delta \varrho_\parallel$. This result was checked by several control tests and then confirmed. In the authors' opinion it may be said on the basis of the material obtained that a surface zone of conductivity exists in the Germanium samples examined. For the time being the authors know of no other explanation for these phenomena.

INSTITUTION: Institute for Physics of the Academy of Science in the Ukrainian SSR.

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V.I.

USSR/Physical Chemistry - Crystals, F-5

Abst Journal: Referat Zhur - Khimiya, No 19, 1956, 60930

Author: Lashkarev, V. Ye., Lyashenko, V. I.

Institution: None

Title: Surface Conductivity of Cuprous Oxide

Original Periodical: Dokl. AN SSSR, 1956, 106, No 2, 243-245

Abstract: Investigated were the effects of adsorption of C_2H_5OH vapor (I) on conductivity σ and mobility u of carriers in samples of Cu_2O calcinated in vacuum at 600°-1,000° and pickled in concentrated HNO_3. σ was measured lengthwise ($\sigma_{\parallel}$) and crosswise ($\sigma_{\perp}$) of the sample. In all samples $\sigma_{\parallel} \gg \sigma_{\perp}$. Ratio $\sigma_{\parallel}/\sigma_{\perp}$ reaches 170. Adsorption of vapor I reduces $\sigma_{\parallel}$ by 5-10 times. The conclusion is reached that $\sigma_{\parallel}$ is practically entirely of surface origin even after adsorption of vapor I. In vacuum u is several times smaller than in atmosphere of vapor I. The sign of Hall effect indicates a hole conductivity. From measurements of σ in the interval from

Card 1/2

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

USSR/Physical Chemistry - Crystals, B-5

Abst Journal: Referat Zhur - Khimiya, No 19, 1956, 60930

Abstract: -70° to +200°, it was calculated according to formula $\sigma = A \cdot \exp(-E/kT)$ that energy of activation of surface ($E_{//}$) and volume ($E_{\perp}$) conductivity is respectively ~0.14 and 0.27 ev.

Card 2/2

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

PA - 2586

AUTHOR LYASHENKO,V.I., SNITKO, O.V.

TITLE The effect of molecules and external electrical field on photoconductivity of semi-conductors.
(Vliyaniye adsorbtsii molekul i vneshnego elektricheskogo polya na fotoprovodimost' poluprovodnikov - Russian)

PERIODICAL Radiotekhnika i Elektronika, 1957 Vol 2, Nr 3, pp 269-277 (U.S.S.R.)
Received 5/1957 Reviewed 6/1957

ABSTRACT Lecture delivered at the All Union Conference for Semiconductors in November 1955 at Leningrad. Investigations were carried out with cuprous oxide and sulphur molybdenum. For the investigation of the influence exercised by adsorption the illuminated surface was left free. When investigating the influence exercised by the field a thin poystirol layer was applied or a thin mica plate was stuck on. A semitransparent gold electrode was applied by evaporation in a vacuum on the polystirol or mica respectively. Experiments were carried out in dry air. There was no surface recombination of photoelectrons on the occasion of these experiments. It follows here from that the times characterizing τ_1 and τ_2 are determined by the life of the electrons on the space levels, which is confirmed by the experiment. Nearly the entire charge which screens off the exterior field and is led to the semiconductor by the voltage source is concentrated in the surface levels. The times characterizing photoconductivity do not change at all. It is further shown that in the case of a modification of the surface charge of the semiconductor the exterior field controls the non-photoactive destuction of exitons on the surface. With a decrease of tem-

Card 1/2

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

The effect of molecules and external electrical field PA - 2586
on photoconductivity of semi-conductors.

perature also the number of exitons in the surface levels is reduced, but the relative modification of the photocurrent increases, which is also in keeping with experimental results. If molecules are adsorbed on the surface the negative surface charge and the curvature of the zones are diminished, but the number of electrons in the acceptor levels grows. These results refer to investigations carried out with cuprous oxide. The photoconductivity phenomena of sulphur molybdenum is in many respects the same as those in the case of cuprous oxide.
(With 7 ill., 4 tables, and 21 citations from Slav publications).

ASSOCIATION
PRESENTED BY
SUBMITTED
AVAILABLE Library of Congress
Card 2/2

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V.I.

LYASHENKO, V.I.; STEPKO, I.I.

The effect of oxygen on the work function of an electron of copper oxide [with summary in English]. Zhur.fiz.khim.31 no.8:1825-1829 Ag '57. (MIRA 10:12)

1. AN USSR, Institut fiziki, Kiyev.
(Oxygen) (Copper oxides--Electric properties)

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

AUTHOR: LYASHENKO,V.I., STEPKO,I.I.

TITLE: A Short Summary of the Results of the Study of the Connection between the Surface Electron States of a Semiconductor Catalytic Phenomena. (Kratkiye itogi izucheniya poverkhnostnykh elektronnykh sostoyaniy poluprovodnika s kataliticheskimi yavleniyami, Russian)

PA - 2750

PERIODICAL: Izvestiia Akad.Nauk SSSR, Ot del Tekhn. 1957, Vol 21, Nr 2, pp 201-205 (U.S.S.R.)

Received: 5 / 1957 Reviewed: 7 / 1957

ABSTRACT: According to the opinion of the authors it is of advantage not to compare the catalytic activity of a semiconductor with conductivity but with the electron states of its surface (more exactly with such a parameter as the work function, which is connected immediately with the surface charge). Arguments in support of such an opinion are supplied by previous experiments carried out by the authors, according to which the work function changes as a result of a modification of the filling-up of the surface charge on the occasion of the absorption of molecules on Cu_2O, CuO, CdO, ZnO and other semiconductors.

For the study of the modification of the work function on the occasion of catalytic reactions the authors used the reaction $2CO+O_2 \rightarrow CO_2$, which in the case of copper oxide occurs at reactions a little higher than room temperature. The authors studied the temperature dependence on the work function of copper oxide in an atmosphere containing oxygen, carbon oxide and carbon dioxide. At from 20° to 150° the work function in the vacuum

Card 1/2

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

A Short Summary of the Results of the Study of the Connection between the Surface Electron States of a Semiconductor Catalytic Phenomena.

remained constant, increased on the occasion of the absorption of oxygen or carbon oxide and remained nearly unchanged in the case of the heating of copper oxide within the given temperature limits. Electric conductivity was also measured on this occasion, and results are shown in form of diagrams. All these tests showed that the temperature dependence of the work function is determined by the process of catalytic reaction and not by the properties of the semiconductor. The authors next endeavor to give an interpretation of their experiments. Perhaps the successful selection of a catalyzer is just based upon the fact that the semiconductor has the right work function and that this condition is valid on its surface. Modification of the work function and the surface electron states of the semiconductors resulting therefrom are connected closely with the catalytic reaction on the surface of the semiconductor. This connection shows new ways for the study of surface states and catalysis. (4 Illustrations).

ASSOCIATION: Physical Institute of the Academy of Science of the Ukrainian S.S.R.
PRESENTED BY:
SUBMITTED:
AVAILABLE: Library of Congress

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

57-27-7-34/40

AUTHOR: Lyashenko, V. I.

TITLE: The Change of Proper Time in Thin Germanium Plates Under the Influence of an External Electric Field and of Adsorption (Izmeneniye sobstvennogo vremeni v tonkikh plastinkakh germaniya pod vliyaniyem vneshnego elektricheskogo polya i adsorbtsii).

PERIODICAL: Zhurnal Tekhnicheskoy Fiziki, 1957, Vol. 27, Nr 7, pp. 1613-1615 (USSR)

ABSTRACT: In the periodical UFZh, 1, 143, 1956, the author investigated the change of the conductivity of germanium under the influence of an external electric field. Now the problem comes up how the surface-recombination and the proper time in thin germanium plates behave under the influence of the same factor. H. K. Henisch, W. N. Reynolds, P. M. Tippe maintain in Physica, 20, 1033, 1955 and Proc.Phys.Soc. B68, 353, 1955, that it is true that the electric field changes the surface-recombination, but in n- and p-germanium in the same manner. As this would be very strange, the case was more closely investigated here. The volume-photo-EMF was used for determining the proper time. It is shown that the changes of the photo-EMF and the proper time increase with

Card 1/2

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

The Change of Proper Time in Thin Germanium Plates Under the the Influence of an External Electric Field and of Adsorption

57-27-7-34/40

an increase in the external field. The change of the photo-EMF E and the proper time τ observed in the n-germanium samples upon influence of the field can by explained by the change of the surface-recombination of the non-equilibrated carriers. In the experiments performed here the grinding of the surface, in contrast to Henisch, essentially changed the proper time. The absence of a difference in the behavior of n- and p-germanium may be explained in the following way. Either an inverse layer exists at the surface of p-germanium or a thin oxide-layer which controls the surface-recombination exists at the surface of n- and p-germanium. In order to determine this problem, tests were made which show that no inverse layer exists at the surface and that the second assumption therefore is the more probable one.

Card 2/2 There are 2 figures and 3 references, 2 of which are Soviet.

ASSOCIATION: Institute of Physics AS Ukrainian SSR, Kiyev (Institut fiziki AN USSR, Kiyev)

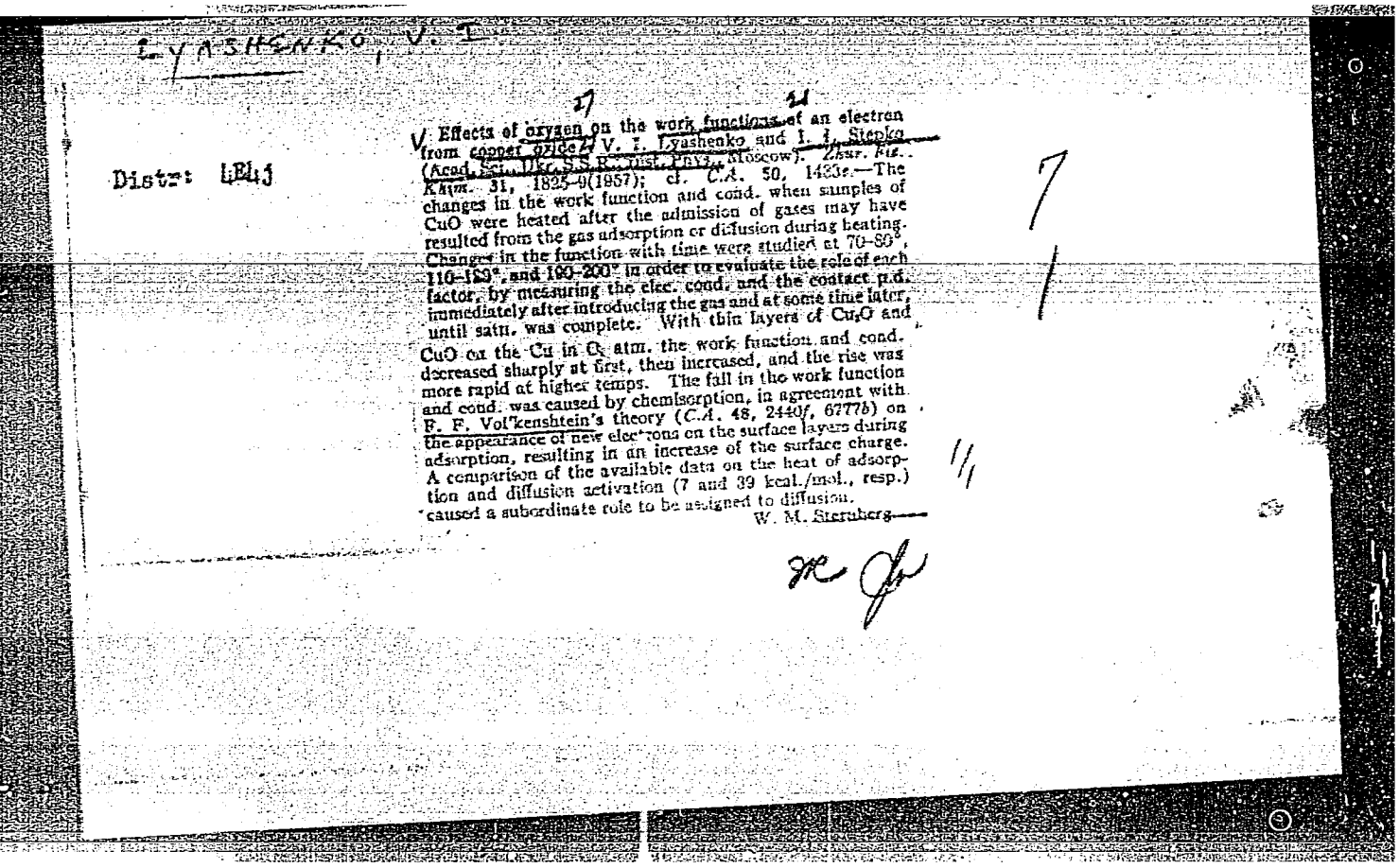
SUBMITTED: February 25, 1957

AVAILABLE: Library of Congress

1. Germanium-Surface properties-Effects of electric field
2. Germanium-Properties-Effects of electric field

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8



LYASHENKO, V. I.

Distr: 4E4j

27 24

V Effects of oxygen on the work functions of an electron from copper oxide. V. I. Lyashenko and I. I. Stepko (Acad. Sci. Ukr. S.S.R., Inst. Phys., Moscow). Zhur. Fiz. Khim. 31, 1825-9(1957); cf. C.A. 50, 1435e.—The changes in the work function and cond. when samples of CuO were heated after the admission of gases may have resulted from the gas adsorption or diffusion during heating. Changes in the function with time were studied at 70–80°, 110–120°, and 190–200° in order to evaluate the role of each factor, by measuring the elec. cond. and the contact p.d. immediately after introducing the gas and at some time later, until satn. was complete. With thin layers of Cu_2O and CuO on the Cu in O_2 atm. the work function and cond. decreased sharply at first, then increased, and the rise was more rapid at higher temps. The fall in the work function and cond. was caused by chemisorption, in agreement with F. F. Vol'kenshtein's theory (C.A. 48, 2440f, 6777b) on the appearance of new electrons on the surface layers during adsorption, resulting in an increase of the surface charge. A comparison of the available data on the heat of adsorption and diffusion activation (7 and 39 kcal./mol., resp.) caused a subordinate role to be assigned to diffusion.

W. M. Sternberg

7

1

11

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V. I., ZOTOV, V., IVANOV, V. and ANDREYEV, V.

"Corrosion Resistance of Certain Materials in Sodium and Lithium."

Paper to be presented at 2nd UN Intl. Conf. on the peaceful uses of Atomic Energy, Geneva, 1 - 13 Sep 58.

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V.I. [Liashenko, V.I.]; SITENKO, T.N. [Sytenko, T.N.]

Conductivity of a Ge surface. Ukr.fiz. zhur. 3 no.1:64-70 Ja-F '58. (MIRA 11:4)

1.Institut fiziki URSR.
(Germanium--Electric properties)
(Hall effect)

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V.I. [Liashenko, V.I.]; RYZHAVSKAYA, N.G. [Ryzhavs'ka, N.H.]

Study of surface recombination by the space photo e.m.f. method [in Ukrainian with summary in English]. Ukr. fiz. zhur. 3 no.2: 216-222 Mr-Ap '58. (MIRA 11:6)

1. Institut fiziki AN URSR.
(Germanium--Electric properties) (Photoelectricity)

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V., doktor fiz.-mat.nauk

Wonderful properties of semiconductors. Nauka i zhyttia 8 no.2:8-12 F '58. (MIRA 13:5)
(Semiconductors)

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

AUTHORS: Lyashenko, V. I., Litovchenko, V. G. 57-28-3-2/33

TITLE: The Influence Exerted by the Adsorption of Molecules Upon the Work Function and the Conductivity of Germanium. I (Vliyaniye adsorbtsii molekul na rabotu vykhoda i provodimost' germaniya. I)

PERIODICAL: Zhurnal Tekhnicheskoy Fiziki, 1958, Vol. 28, Nr 3, pp. 447 - 453 (USSR)

ABSTRACT: The influence of the adsorption was here investigated at the germanium surface etched (as is usually done in the production of instruments) and at a germanium surface purified as much as possible (e. g. by means of heating in a vacuum). The influence of the adsorption of dipole-molecules (alcohol, acetone, carbon monoxide) and non-dipole-molecules (benzene, oxygen) upon the work function and the conductivity of germanium was investigated. The method of investigation was similar to that employed by the authors in references 1 to 3. The work function was measured by means of the vibration-meter for the potential-contact-gradient developed in the laboratory. According to its nature it is a Thomson method

Card 1/ 4

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

transformed into electronics. The electric conductivity was measured according to the compensation-probe-method. The measurements were performed on 16 monocrystal plates with electron-, hole- and intrinsic conductivity and specific resistance ρ = 7 - 55 ohm.cm and an eigen time τ = 100 - 1000 µsek. The results of measurement show that by the adsorption of dipole as well as non-dipole molecules the work function decreases. An exception is only made by oxygen whose work function is usually increased by the adsorption, although sometimes, especially in germanium with hole-conductivity, a slight decrease in the work function was observed. The modifications of the work function and of the resistance in highly resistive samples are higher than those in low- -resistance ones. These modifications increase with increasing pressure of the adsorbed vapors. In the case of saturated vapor pressures a liquid-film forms at the germanium surface and a high modification of $\Delta\varphi$ is observed. $\Delta\varphi$ denotes the modification of the work function. $\Delta(R)(p)$ - (modification of resistance, caused by the molecule-adsorption) has an analogous nature, but depends on the type of electric conductivity of germanium. In germanium with electron-

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

The Influence Exerted by the Adsorption of Molecules Upon the Work Function and the Conductivity of Germanium. I

-conductivity the resistance decreases in the case of adsorption of vapors, in germanium with a hole-conductivity it increases. This correlation between the modification $\Delta\varphi(p)$ and $\Delta R(p)$ and the type of conductivity also continues when the work function increases due to oxygen adsorption. In this case the resistance of the samples with electron--conductivity increases, whereas it decreases in samples with a hole-conductivity. The nature of the adsorbed molecules (with the exception of oxygen) does not influence the sign of the work-function modification and of the conductivity, but considerably influences the amount of its modification. The experiments were performed at room and elevated temperatures. The quantity $\Delta\varphi$ markedly decreases with a rise of temperature, its sign remaining negative. An exception was made by oxygen by which the sign changed and $\Delta\varphi$ considerably increased (with a rise of temperature). - The results of the measurements performed here yield the possibility by using the paper by Garret and Brattain (reference 6) to estimate the values of the surface potential V_s and to compare them with the observed values of ΔV_s.

Card 3/4

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

The Influence Exerted by the Adsorption of Molecules Upon the Work Function and the Conductivity of Germanium. I

57-28-3-2/33

It is shown that as well in p- as in n-germanium in the case of the adsorption of different molecules V_s approaches the space-potential. An exception is made by dry oxygen in which V_s derives from the space-potential. The work was discussed with V. Ye. Lashkarev, Division Manager, Member of the AS Ukrainian SSR, and K. B. Tolpygo. A. N. Kvasnitskaya and E. B. Mertens placed the crystals at the authors' disposal. There are 7 figures, 3 tables, and 6 references, 4 of which are Soviet.

ASSOCIATION: Institut fiziki AN USSR, Kiyev
(Kiyev Institute for Physics AS Ukrainian SSR)

SUBMITTED: July 19, 1957

1. Germanium---Conductivity 2. Germanium---Adsorptive properties
3. Molecules---Adsorption 4. Work functions

Card 4/4

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

57-28-3-3/33

AUTHORS: Lyashenko, V. I. , Litovchenko, V. G.

TITLE: The Influence Exerted by the Adsorption of Molecules Upon the Work Function and the Conductivity of Germanium (Vliyaniye adsorbtsii molekul na rabotu vykhoda i provodimost' germaniya) II. The Kinetics of the Process (II. Kinetika protsessa)

PERIODICAL: Zhurnal Tekhnicheskoy Fiziki, 1958, Vol.28, Nr 3, pp.454-459 (USSR)

ABSTRACT: The authors here investigated the kinetics of the modification of the work function and that of the conductivity in germanium in the case of adsorption of molecules. The eigen time of the process and its dependence on the vapor pressure and -temperature were determined. The measurement was made in the same apparatus and according to the same method as in Reference 1. The same samples were used as well. The kinetics of the process depend on the surface treatment of germanium. A steady value for the work function was obtained

Card 1/4

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

The Influence Exerted by the Adsorption of Molecules Upon the Work Function and the Conductivity of Germanium. II. The Kinetics of the Process

within 200 - 250 sec. in the case of a surface etched in perhydrol, and within 400 - 500 sec. in the case of a surface etched in perhydrol with nitric acid and heated in a vacuum. The analysis of the obtained curves for the modification of the work function shows that beside the rapid process also observed in other semiconductors a continuous process also takes place. This latter follows the exponential law

$\Delta\varphi = \Delta\varphi_{st}(1 - e^{-t/\tau})$, where $\Delta\varphi_{st}$ denotes the stabilized value of the modification of the work function. τ denotes the eigen time. It is shown that τ varies within a wide range in dependence on the pressure of the adsorbed vapors and on temperature. $\tau(p)$ can be represented as a hyperbola $\tau = \frac{1}{ap^n}$. Here $n \simeq 0{,}5$ and does not depend on the nature of the adsorbed molecules, whereas the coefficient a depends on them. It is shown that $\tau(p)$ in degasification of the surface remains equal; the quantity τ itself, however, is modified. At more degassed surfaces τ

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

The Influence Exerted by the Adsorption of Molecules Upon the Work Function and the Conductivity of Germanium. II. The Kinetics of the Process

was smaller. The results of the experiments showed that the establishment of the equilibrium in the case of adsorption is rendered difficult. As was already said in reference 1 a high surface potential exists at the surface of the germanium samples used here, which is apparently due to the occurrence of an oxide layer. Therefore it is assumed that the time effects observed here are due to the transition of the electrons to the surface of the sample through such a barrier layer. The continuous process observed here is in the authors' opinion connected with the production of the equilibrium at the external surface levels. A long eigen time τ was observed here. It is possible that a short time connected with the inner levels also exists. But by means of the method employed here it is not possible to investigate the kinetics of the short-time effects.

The work was discussed with V. Ye. Lashkarev, Division Manager, Member of the AS Ukrainian SSR, and K. B. Tolpygo. There are 8 figures, and 8 references, 1 of which is Soviet.

Card 3/4

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

57-28-3-3/33

The Influence Exerted by the Adsorption of Molecules Upon the Work Function and the Conductivity of Germanium. II. The Kinetics of the Process

ASSOCIATION: Institut fiziki AN USSR, Kiyev
(Kiyev Institute for Physics AS Ukrainian SSR)

1. Germanium--Conductivity 2. Molecules--Adsorption 3. Germanium --Adsorptive properties 4. Work functions 5. Germanium--Vapor pressure 6. Germanium--Temperature factors

Card 4/4

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V.I.; CHERNAYA, N.S.

Mechanism of increasing long changes in the field effect.
Fiz. tver. tela 1 no.6:878-885 Je '59. (MIRA 12:10)

1.Institut fiziki AN USSR.
(Germanium--Electric properties)
(Adsorption)

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

66245

~~24(6)~~ 24.7700

AUTHORS: Lyashenko, V. I., Chernaya, N. S. SOV/181-1-7-1/21

TITLE: On the Nature of Relaxation Processes in the Field Effect

PERIODICAL: Fizika tverdogo tela, 1959, Vol 1, Nr 7, pp 1005-1014 (USSR)

ABSTRACT: A germanium plate (15 · 10 · 0.15 mm, n- and p-type) with soldered tin electrodes was cleaned in hot hydrogen peroxide and then stored in air for a few weeks. During this time a stable oxide coating formed on the surface. The one plate of the measuring condenser was provided by one of these samples, whereas the second condenser plate consisted of either a brass plate or of a mica sheet coated by a semi-transparent platinum layer. Mica layers may be placed between the condenser plates. A voltage of 0.1 - 2.5 kv may be applied to the condenser. The complete condenser with mounting was housed within an evacuable pot. The vacuum obtained: $\sim 10^5$ torr. It was also possible to fill the vacuum space with dry oxygen, nitrogen, CO_2, or common air. The field effect was measured by means of a compensating circuit with the potentiometer PPTV-1 using a mirror galvanometer (sensitivity $1 \cdot 10^{-10}$ a/mm) as balancing apparatus. The

Card 1/3

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

On the Nature of Relaxation Processes in the Field Effect

sensitivity of the total circuit was 0.001%. The following was investigated by experiments: The dependence of relaxation processes in the field effect on the medium surrounding the samples, dependence of the long-delay change of the field effect on different factors, e.g. the influence of the medium surrounding the samples. The change with time of an additional contact potential caused by an external electric field. Measurement of ionic currents and their influence on the relaxation processes in the field effect (sample in air environment). The experimental results confirm the importance of the ionic mechanism for the relaxation phenomena of the additional conductivity caused by an external electric field. The mechanism works in the following way: the mobile ions of the medium, surrounding the sample, reach the plate of the measuring condenser and screen progressively the germanium sample from the influence of the external electric field between the condenser plates. The formation of ions is mainly caused by the eigen-electronic emission of the semiconductor surface and the metallic electrode. The relaxation rate is influenced by the ionic concentration of the medium surrounding the sample. The relaxation constant depends on the

4

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

On the Nature of Relaxation Processes in the Field Effect

evacuation rate, on the filling gas and on the field strength between the sample and the metallic electrode. The ionic currents between the condenser plates accompanying the relaxation process in the field effect were measured and the the following result was obtained: the charge accumulation on the layer near the surface of the sample - in consequence of the decline in the additional conductivity in the field effect - equals the charge which is carried by the ionic currents between the plates of the measuring condenser. The investigations of the following authors are especially mentioned in the beginning: Kalashnikov, Yunovich, Snitko, Lyashenko, Pavlenko, Litvinov. There are 6 figures, 3 tables, and 17 references, 5 of which are Soviet.

ASSOCIATION: Institut fiziki AN USSR, Kiyev (Physics Institute of the AS UkrSSR, Kiyev)

SUBMITTED: June 20, 1958

Card 3/3

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

66342
SOV/181-1-10-17/21

~~24(6)~~ 24.7700

AUTHORS: Litovchenko, V. G., Lyashenko, V. I.

TITLE: Investigation of "Rapid" Surface States of Germanium

PERIODICAL: Fizika tverdogo tela, 1959, Vol 1, Nr 10, pp 1609 - 1621 (USSR)

ABSTRACT: The method used here is similar to that described in references 3 and 4. A square pulse field was applied to the measuring condenser. The two plates of the condenser were made up of the sample and a metallic plate. A mica layer of equal thickness up to some μ separated the two plates. In order to calculate the charges resulting from the induced field, the authors measured the condenser capacity by means of a Coulomb meter. Parasitic capacities in the range to be measured were eliminated by compensation. The square pulses were produced by a multivibrator with a variable reciprocal of the pulse duty factor, which generated at the output a 150-v tension of both polarities with a duration of 500 μsec approximately. The p-germanium foil (15.5.0.3 mm^3, ρ= 20-30 Ω.cm, τ=200-1000 μsec, s= 50-300 cm/sec) was cut of the crystal perpendicular to the (110)-axis, etched in SP-4 and hydrogen peroxide, washed in distilled water and stored in air for some months to form

Card 1/2

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

Investigation of "Rapid" Surface States of Germanium

66342
SOV/181-1-10-17/21

a stable surface. The dependence $\Delta\sigma_\eta : Q_{si}$ was measured in vacuum ($\sim 10^{-6}$ torr) and air at various constant transverse field strengths (Figs 1-4). The parameters of the "rapid" surface states were calculated for the various experimental conditions with the help of the afore-mentioned curves (Fig 5, Tables 1-4). Final digest: 1) The short action of even very strong constant fields does not affect the parameters N_I and N_{II} of the samples. 2) A constant transverse field does not greatly change the parameters N and E up to field strengths $\lesssim (0.5\text{-}1)10^5$ v/cm. 3) At field strengths $> (0.5\text{-}1)10^5$ v/cm, the parameters of the "rapid" surface states vary whereas their energy states remain unaffected. 4) The concentration of the levels III and IV remains constant. 5) As regards the sign of E_p, asymmetry is to be observed with respect to the effect exerted by the constant field on the parameters N_I and N_{II}. 6) Parameter N_I is affected by the adsorption of dry air. This indicates that there is a direct relationship between O_2 and level I. There are 5 figures, 4 tables, and 9 references, 4 of which are Soviet.

ASSOCIATION: Institut Fiziki AN USSR (Institute of Physics of the AS UkrSSR)
SUBMITTED: February 26, 1959
Card 2/2

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V.I.; LITOVCHENKO, V.G. [Lytovchenko, V.H.]; SAMBUR, I.G. [Sambur, I.H.]

Surface states of germanium. Ukr.fiz.zhur. 4 no.4:465-471 Jl-Ag '59. (MIRA 13:4)

1. Institut fiziki AN USSR, kafedra poluprovodnikov Kiyevskogo gosudarstvennogo universiteta.
(Germanium)

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V. I.

"Electron States on Si and Ge Surfaces."

report presented at the International Conference on Semiconductor Physics, Prague, 29 Aug - 2 Sep 60.

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

Lyashenko, V.I.

PHASE I BOOK EXPLOITATION SOV/3921

Akademiya nauk SSSR. Institut fizicheskoy khimii

Problemy kinetiki i kataliza. [t] 10: Fizika i fiziko-khimiya kataliza (Problems of Kinetics and Catalysis. [vol.] 10: Physics and Physico-Chemistry of Catalysis) Moscow, Izd-vo AN SSSR, 1960. 461 p. Errata slip inserted. 2,600 copies printed.

Eds.: S.Z. Roginskiy, Corresponding Member of the Academy of Sciences USSR, and O.V. Krylov, Candidate of Chemistry; Ed. of Publishing House: A.L. Bankvitser; Tech. Ed.: O.A. Astaf'yeva.

PURPOSE: This collection of articles is adressed to physicists and chemists and to the community of scientists in general interested in recent research on the physics and physical chemistry of catalysis.

COVERAGE: The articles in this collection were read at the conference on the Physics and Physical Chemistry of Catalysis organized by the Otdel khimicheskikh nauk AN SSSR (Section of Chemical Sciences, Academy of Sciences USSR) and by the Academic Council on the problem of "the scientific bases for the selection of catalysts." The Conference was held at the Institut fizicheskoy khimii AN SSSR (Institute of Physical Chemistry of the AS USSR) in Moscow, March 20-23, 1958. Of the great volume of material presented at the conference, only papers not published elsewhere were included in this collection.

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V.I.

S/181/60/002/007/032/042
B006/B060

AUTHORS: Litovchenko, V. G., Lyashenko, V. I.

TITLE: Investigation of the Kinetics of Fast Surface States of Germanium

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 7, pp. 1592-1596

TEXT: The authors studied the kinetics of the field effect $\tau_{f.e.}$ and of photoconductivity $\tau_{e.ph.}$ on over 15 high-resistivity n- and p-type germanium samples (20 - 25 ohm.cm); $\tau_{vol} \gtrsim 200$ μsec) at room temperature. A transverse field with Π-shaped pulses, light, and a constant field were used to change the primary curvature of the zone Y_s^o. The samples, 70-300 μ thick, were etched with various agents and the following were then measured: 1) $\tau_{f.e.}(T)$, $\tau_{e.ph.}(T)$; 2) $\tau_{f.e.}$ as a function of the constant transverse field V as well as $\tau_{surf}(V)$; 3) $\Delta\sigma_1(V)$ and $\Delta\sigma_2(V)$; $\Delta\sigma_1$ denotes the primary, $\Delta\sigma_2$ the quasisteady variation of σ_{surf}; 4) $\tau_{e.ph.}(V)$ and

Card 1/2

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

$\tau_{ph.quasist.}(V)$. The measurements were made at different temperatures both in the dark and at a low constant illumination. Fig. 1a shows $\tau_{f.e.}(T)\big|_{V=0}$ which illustrates the course typical of stripping processes; curve 1 is drawn in the dark, curve 2 under illumination; the activation energy was 0.27 and 0.18 ev, respectively. $\tau_{f.e.}(V)$ at 258, 228, 187, and 174°K is shown in Fig. 1b. The maxima of $\tau_{f.e.}$ attain some 100 microseconds. Fig. 2 shows the other functions investigated. The results are compared with those of other authors and are discussed. A table supplies, for two germanium samples, numerical values of $\tau_{f.e.}$ and $\tau_{e.ph.}$ in μsec for different surface states. There are 2 figures, 1 table, and 15 references: 5 Soviet, 9 US, and 1 British.

ASSOCIATION: Institut fiziki AN USSR Kiyev
(Institute of Physics of the AS UkrSSR, Kiyev)

SUBMITTED: November 30, 1959

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

84589

S/181/60/002/010/011/051
B019/B070

9,4340 (1143,1160)
24.7700 (1043 only)

AUTHORS: Lyashenko, V. I., Chernaya, N. S., and Gerasimov, A. B.

TITLE: A Study of the Energy Distribution of the Surface Electron States on a Purified Germanium Surface and in the Case of Adsorption of Oxygen

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 10, pp. 2421-2430

TEXT: The method of purifying the germanium surface is described in the first section, the process used being that proposed by Farnsworth. The block scheme of the vacuum arrangement and the experimental tube are shown in Figs. 1 and 2, respectively. The samples were p-type germanium with a resistivity of 40 ohm.cm and a volume lifetime of 300 microseconds. The surface purified lay in the (111) plane. The surface levels were determined by a method described in Refs. 4 and 14, which depends on the comparison of the theoretical and experimental dependences of the additional conduction on the surface charge. In Figs. 4,5, and 6 are shown, respectively, the volt - ampere characteristic of the samples under different conditions of the surface, the additional conduction as a function of the

Card 1/3

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

84589

A Study of the Energy Distribution of the Surface Electron States on a Purified Germanium Surface and in the Case of Adsorption of Oxygen

S/181/60/002/010/011/051
B019/B070

charge on the surface, and the charge in the surface states as a function of the surface potential. From the results it is concluded that on pure germanium surfaces, energy states of large density with $E_t = -11kT$ are Tamm's states; that these levels are not formed by the adsorption of the residual gas; that it is improbable that the high density is due to the atoms which diffuse to the surface during the final annealing in the process of purification and which are difficult to desorb. The structure on the surface of germanium is found to deviate from the regular germanium structure; levels lying at $E_t = -11kT$ were not observed for true surfaces. The model of Tamm's levels agrees completely with the data on oxygen adsorption. Oxygen lowers the density of the surface states. It is shown that levels with the parameters $E_t = -2,5kT$ and $N_t \simeq 10^{11}$ cm^{-2} are due to oxygen which saturates the free covale ' bonds of the surface atoms of germanium. These "oxygen" levels could not be observed on true surfaces. N. N. Kvasnitskaya and K. K. Shtan'ko are thanked for breeding the crystal. There are 6 figures, 1 table, and 21 references: 5 Soviet, 14 US, and 1 Japanese.

Card 2/3

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

84589

A Study of the Energy Distribution of the Surface Electron States on a Purified Germanium Surface and in the Case of Adsorption of Oxygen

S/181/60/002/010/011/051
B019/B070

ASSOCIATION: Institut fiziki AN USSR Kiyev (Institute of Physics of the AS UkrSSR, Kiyev)

SUBMITTED: March 29, 1960

Card 3/3

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

24.7700

26591

S/185/60/005/003/006/020
D274/D303

AUTHORS: Prymachenko, V. Ye., Lytovchenko, V.G., Lyashenko, V.I. and Snitko, O.V.

TITLE: The study of fast and slow electron states on a germanium surface

PERIODICAL: Ukrayins'kyy fizychnyy zhurnal, v. 5, no. 3, 1960, 345-356

TEXT: The effect of an external electric field is studied on the dark conductivity (the field effect) and on the surface recombination of thin germanium plates in vacuo. The field effect was investigated at a d.c. voltage, as well as by applying rectangular pulses; this made it possible to determine separately the parameters of the fast and slow surface states. The method of investigation used is more advantageous than earlier methods; in particular, it permits studying all the surface states on a single specimen. The size of the specimens was approximately 1.5 x 0.5 x 0.015 cm. The specimens

Card 1/5

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

were treated with CP-4 and, after measurements, with boiling H_2O_2. The germanium plates were p-type with specific resistance 40 - 50 Ohm. The specimen served as one plate of a capacitor to which a d.c. voltage of 2500 v was applied as well as an a.c. voltage (rectangular pulses). The dark conductivity σ was measured by a compensation method. The change in conductivity $\Delta\sigma$ (following the application of the rectangular pulses), was measured by a special circuit. The rate of surface recombination was determined by the effective relaxation time τ of the photoconductivity, following the illumination of the middle part of the specimen by the rectangular pulses of light. The relaxation of the photocurrent followed an exponential law. A diagram is given of the circuit used for the investigation. Curves are given for $\Delta\sigma$ as a function of the charge Q induced on the germanium surface. The presence of a minimum on the experimental curve $\Delta\sigma(Q)$ permitted determining the surface potential Y for each Q. The total surface potential reaches 15 kT/e $\approx$ 0.38 eV., i.e. it is approximately equal to half the width of the forbidden germanium zone. Further, the field effect makes it

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

possible to determine the charge Q_s in both fast and slow states, ($Q_s = Q - Q_o$, where Q_o is the space charge). The surface charge in fast states changes relatively little for small Y, whereas for large Y it changes rather sharply. The dependence of Q_s on Y leads to the interpretation of the energy levels (discrete vs. continuous). The authors assume discrete interior levels; this assumption is supported by the results of recombination measurements and is also in agreement with A. Many's results (Ref. 21: J. Phys. Chem. Solids. 8, 87, 1959). Therefore, the results obtained from the field effect for the fast states are interpreted by the authors by means of a model of four discrete levels, whose parameters are given in a table; for the slow states, two discrete levels are assumed. The charge of the slow states is much greater than that of the fast states. Hence the slow states are of basic importance in screening the constant external field. Further, the dependence of the rate of surface recombination s on the surface potential Y is plotted and discussed. The fast levels are responsible for the recombination; two or even three such levels can substantially contribute to it; but, in gen-

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

eral, one of the fast levels is predominant in surface recombination. The values of the capture cross-sections of electrons and holes are given in the table. The measured values of the parameters of the surface levels depend on the etching method (by means of CP-4 or by H_2O_2) and on whether the surfaces were freshly etched or a long time ago (their previous history); thereby the difference in the parameters is, however, not as considerable as should have been expected; the concentration of the fast states, and especially their recombination capacities show considerable dependence on the previous history of the specimens. Finally, the presence of an oxide layer on the germanium surface is considered as definitely established; this layer has a complex chemical and polycrystalline structure. The layer is the main reason for the complex system of surface states of germanium. The slow states are found on the outer surface of the oxide, being mainly determined by adsorbed atoms, whereas the fast states are on the interface Ge-oxide, being mainly due to imperfections of structure and extraneous atoms. There are 5 figures, 1 table and 36 references: 14 Soviet-bloc and 22 non-Sov-

Card 4/5

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

iet-bloc. The 4 most recent references to English-language publications read as follows: E. Harnik. G. Margoninski, Phys. a.Chem. Solids, 8, 96, 1959; A. Many, J. Phys. Chem. Solids, 8, 87, 1959; R.E. Schlier, H.E. Farnsworth, J. Chem. Phys., 30, 917, 1959; G.A. Barnes, P.C. Banbury, J. Phys. Chem. Solids, 8, 111, 1959.

ASSOCIATION: Instytut fizyky AN USSR (Physics Institute, AS Ukr SSR)

SUBMITTED: November 5, 1959

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

27955
S/185/60/005/004/015/021
D274/D306

24,7700 (1143, 1138, 1164)

AUTHORS: Lyashenko, V.I. and Chornaya, N.S.

TITLE: Electron levels on a clean germanium surface

PERIODICAL: Ukrayins'kyy fizychnyy zhurnal, v. 5, no. 4, 1960, 568-569

TEXT: A clean germanium surface was obtained by Farnsworth's method. The specimen was placed in a vacuum lamp; a vacuum of the order of (1 to 2)·10^{-9} mmHg was controlled by means of an Alpert manometer. The surface was cleaned by an ion gun; the work function at the surface of the specimen was measured by means of an electron gun. The degree of cleanliness of the investigated surface was evaluated by the changes in the work function. A graph is shown with the volt-ampere characteristics related to the cleanliness of the germanium surface; these characteristics are compared with a standard curve. Taking into consideration the accuracy (0.05 v) of

Card 1/3

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

27955
S/185/60/005/004/015/021
D274/D306

Electron levels...

determining the work function by the method of volt-ampere characteristics displacement, and also the adsorption of various gases on the clean surface, it can be assumed that a surface was obtained on which less than 0.25 of the mono-atomic layer was absorbed. The increase in conductivity ΔG, due to an external electric field (the field effect), was investigated, ΔG being a function of the induced charge, $\Delta G = f(Q)$. The results of the measurements were compared with theoretical curves computed on the basis of Garrett-Brattain and Schrieffer's theory. This led to the conclusion that, on a clean germanium surface, a level exists with a depth of $E_{t_1} \simeq -11$ kT with respect to the middle of forbidden zone, and a concentration $N_{t_1} \simeq 2.5 \cdot 10^{14} cm^{-2}$. After measurements of the clean surface, oxygen was introduced by means of barium-oxide, and the field-effect was again measured. This lead to the establishment of a newly formed level with $E_{t_2} \simeq -2.5$ kT with respect to the middle of the forbidden zone and a concentration of approximately $10^{11} cm^{-2}$.

Card 2/3

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

27955
S/185/60/005/004/015/021
D274/D306

Electron levels...

The concentration of the levels is of the same order as the surface concentration of germanium atoms. It can be assumed that these are Tamm-levels. The levels which were observed after the oxygen absorption, are "oxygenic" levels. They can be observed at not very low pressures, too. There is 1 figure and 6 non-Soviet-bloc references. The references to the English-language publications read as follows: H.E. Farnsworth, R.E. Schiller, T.H. George, R.M. Burger, J. Appl. Phys., 26, 252, 1955; 29, 1150, 1958; G. Barnes, P. Bambury, Proc. Phys. Soc., 71, 1020, 1958; Phys. Chem. Solids, 8, 11, 1959; I.A. Dillon, H.E. Farnsworth, J. Appl. Phys., 28, 174, 1957; C.G. Garrett, W.H. Brattain, Phys. Rev., 99, 376, 1955; I.R. Schrieffer, Phys. Rev., 97, 641, 1955; W.L. Brown, W.H. Brattain, C.G. Garrett, H.C. Montgomery, Semicond. Surf. Phys., p. III, 1956.

ASSOCIATION: Instytut fizyky AN USSR (Physics Institute, AS UkrSSR)

SUBMITTED: March 28, 1960

Card 3/3

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

89276
S/181/61/003/001/008/042
B102/B212

24.7600 (1043,1158,1160)

AUTHORS: Litovchenko, V. G. and Lyashenko, V. I.

TITLE: Investigation of the properties of a germanium surface at different temperatures. I. Amplitude characteristics

PERIODICAL: Fizika tverdogo tela, v. 3, no. 1, 1961, 61-72

TEXT: The properties of a real germanium surface at room temperature are well known, but those at low temperatures have hardly been investigated; and it is uncertain whether the energy distribution of the surface levels in the forbidden band is discrete or continuous. A knowledge of the temperature dependence of the electron surface-state parameters (E, N, and the trapping cross sections C_p and C_n) could clarify this problem, but the T-functions had to be known for each single surface level in a large temperature interval. The authors investigated several parameters in the region of 170-305°K, which are characteristic of the surface properties of germanium, and this paper reports on the results. The experimental method has been described in Refs. 4, 6, 7. 70-300μ thick n-type Ge specimens of

Card 1/9

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

quadratic shape have been investigated; they had been cut in the (110) plane, and had a resistivity of 20-45 ohm.cm (at 300°K), a volume lifetime of $\tau_0 \simeq 250\text{-}10^3$ μsec, and s = 100-200 cm/sec. The following measurements were made: initial change of the conductivity $\Delta\sigma_0$ of the specimen due to field pulses (10^{-6} sec); the change $\Delta\sigma_2$ after the relaxation processes; the change $\Delta\sigma_3$ 30 sec after the field had been turned on; the proper time τ_p of the short-period relaxation of the field effect, and the proper time τ_e of the relaxation of photoconductivity. The dependence of these quantities upon a constant transverse electric field has been measured for a number of fixed T-values between 170 and 305°K, and the temperature dependence of kinetic characteristics without a transverse field (E_t=0) has been recorded. The results of the measurements are illustrated in diagrams. Fig. 1 shows $\Delta\sigma_3$ as a function of a charge Q_i which had been induced on the semiconductor by a constant transverse field for n-type Ge, $n_o = 5.4 \cdot 10^{13}$ cm^{-3} in a vacuum. Fig. 2 shows the initial bend of the band,

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

Investigation of the properties...

$Y_0(T)$, and the work function $\chi(T)$ of different surface states as functions of temperature. For n-type specimens, Y_0 changes to negative values with a decreasing temperature (at $T \simeq 175^\circ K$, $Y_0 \lesssim -5.5$ kT/e) but increases for p-type specimens in the positive range. Measurement of the quantities $\Delta\sigma_0$ and $\Delta\sigma_2$ made it possible to determine the mobility of the field effect ($\mu_{f.e.} = \Delta\sigma_p/\Delta Q_i$). Fig. 3 shows the initial mobility $\mu_{f.e.0}$ and the quasi-steady $\mu_{f.e.2}$ as functions of the surface potential Y for various values of T. The parameters of the fast surface levels have been calculated from experimental data on $\mu_{f.e.}(Y)$; results are given in Table 1.

Analogous computations were made for slow surface levels, Table 2 gives the results. The investigations showed that fast and slow surface levels have the following in commom: They are discrete, show the same number, and the concentration of the mean surface levels is about one order of magnitude smaller than that of the outer ones. The position of the fast surface energy levels does not fully agree with that of the slow levels, but this deviation is less than 2 kT/e. The concentrations of the slow surface

Card 3/4

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

89276

S/181/61/003/001/008/042
B102/B212

Investigation of the properties...

levels are in all cases 2-4 times higher then those of the fast surface levels. There are 5 figures, 2 tables, and 38 references: 14 Soviet-bloc and 24 non-Soviet-bloc.

ASSOCIATION: Institut fiziki AN USSR Kiyev (Institute of Physics, AS UkrSSR, Kiyev)

SUBMITTED: May 30, 1960

Legend to Tables: 1) Number of specimen; 2) surface state; 3) within 24 hr after etching; 4) aged specimen; 5) within 3 hr after etching.

Card 4/4

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LITOVCHENKO, V.G.; LYASHENKO, V.I.

Investigating the properties of the surface of germanium at various temperatures. Part 2: Kinetics of processes. Fiz. tver. tela 3 no.1:73-88 Ja '61. (MIRA 14:3)

1. Institut fiziki AN USSR, Kiyev.
(Germanium)

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

27303
S/181/61/003/008/033/034
B111/B102

9.4177

AUTHORS: Lyashenko, V. I., and Skubenko, A. F.

TITLE: Effect of impurities upon the properties of Sb_2S_3

PERIODICAL: Fizika tverdogo tela, v. 3, no. 8, 1961, 2499-2501

TEXT: In insufficiently purified Sb_2S_3 single crystals, the authors found an additional maximum in the spectral distribution of the photoelectric current due to impurities, and also a growth of the dark current with time. If a 10-v potential is applied to the specimen, the current drops due to polarization; at 20 v, the current first drops due to polarization, and then it rises again with time. At 30 and 50 v, only a rise of current will be observed. This rise is not observable with alternating currents. It is also of interest to study this effect in synthetic Sb_2S_3 single crystals.

The temperature dependence of the maximum rise of conductivity was studied; from the slope of the curve, the activation energy was found to be $\Delta u = 0.48$ ev, and the width of the forbidden band = 1.55 ev. Then, for comparison, high-purity Sb_2S_3 crystals were produced, and the $I_{ph}(\lambda)$

Card 1/2

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

Effect of impurities upon the...

curves were plotted. It was found that with increasing purity the second maximum in these curves vanished, and after 18-20 fold zone melting no current growth could be observed. Since in all measurements $\sigma_{\parallel} = \sigma_{\perp}$ ($\sigma_{\parallel}$ - conductivity along the specimen, $\sigma_{\perp}$ - perpendicular thereto), the current rise could be caused only by a rise of the carrier concentration, and not by a growth of the dendrites. In the experiments, the potential jump was found to increase at the anode and to decrease at the cathode after a prolonged passage of current. The reverse was observed with a reversal of current. The current rise is therefore very probably caused by electrolysis of ionized impurities which are adhesion centers for the holes. These impurities are not discharged at the electrodes, but form a volume charge which can facilitate the passage of current. For the pure single crystals, the photoconductivity maximum was found at $\lambda = 710$ mμ. The forbidden-band width was found to be 1.63 ev (according to red-edge measurements) or 1.55 ev (according to $\sigma(T)$ measurements). There are 2 figures and 4 Soviet references.

ASSOCIATION: Institut poluprovodnikov AN USSR, Kiyev (Institute of Semiconductors AS UkrSSR, Kiyev)

SUBMITTED: March 20, 1961

Card 2/2

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

28082
S/181/61/003/009/014/039
B102/B104

24,7700

AUTHORS: Dobrovol'skiy, V. N., and Lyashenko, V. I.

TITLE: Study of the drift of the excess carriers in the magnetic field

PERIODICAL: Fizika tverdogo tela, v. 3, no. 9, 1961, 2646-2658

TEXT: The propagation of an excess carrier concentration in n-type and p-type germanium located in a transverse magnetic field and traversed by current has been studied theoretically and experimentally. Fig. 1 shows the orientation of the field components on the specimen. Using equations given in UFZh, 5, 333, 1960 for the cases $E_{oy} = E^{o}_{oy}$ and $E_{oy} = 0$ (E^{o}_{oy} - Hall field), the author derives expressions for the carrier mobilities. The carrier drift was experimentally studied by measuring the field dependence of the quantities μ'_{px}/μ_p and μ'_{py}/μ_p (relative hole mobilities) and the analog quantities for electrons. For a short time an approximately 100-μ wide light line was projected to the germanium plate in which the carrier drift was studied. The carriers produced by this light line

Card 1/4

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

propagated and, after a certain time, reached the collector which was located at the distance Δx_o from the light line. This time was measured first at H = 0 (t_o) and then at $H \neq 0$ ($t_o \pm \Delta t$) at constant E_{ox}. t_o and Δt were measured at different numbers of electron-hole pairs. Subsequently, the authors extrapolated for zero. From the thus obtained values t_o^o and Δt^o the authors calculated the relative carrier mobility using the relation $\mu'_{px}/\overline{\mu}_p = t_o^o/(t_o^o + \Delta t^o)$. $\overline{\mu}_p = (\mu_1 p_1 + \mu_2 p_2)/(p_1 + p_2)$ where μ_i and p_i denote the mobilities and the concentrations of the light and heavy holes. To determine $\mu'_{py}/\overline{\mu}_p$ the light pulse was projected to the specimen in a line which is shown in Fig. 1b and the distances $\Delta y_o/2$ and Δx_o were then measured in which the maximum carrier concentrations were observed after the time t_o. After extrapolation for zero pair number the relative mobility was calculated by the relation $\mu'_{py}/\overline{\mu}_p = \Delta y_o^o/2\Delta x_o^o$. Hence, the otherwise equivalent methods differed in that in the first case time was measured at

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

4

constant distance, in the second, the distance was measured at constant time. The practical measurements were made in two n-type and one p-type germanium specimens. The results were in good agreement with the theory. Using these results the authors calculated $r = p_2/p_1$ and $\lambda = \mu_2/\mu_1$, i.e. equation

$$\left.\begin{aligned} \mu^0_{px} = \frac{K'(\gamma_1) + r\lambda K'(\lambda^2\gamma_1)}{1 + r\lambda}\bar{\mu}_p;\quad \mu^0_{pH} = \frac{\sqrt{\pi}}{2}\gamma_1^{1/2}\frac{L'(\gamma_1) + r\lambda^2 L'(\lambda^2\gamma_1)}{1 + r\lambda}\bar{\mu}_p, \\ \gamma_1 = \frac{9\pi}{16c^2}\mu_1^2H^2 = \frac{9\pi}{16c^2}\left(\frac{1+r}{1+r\lambda}\right)^2\bar{\mu}_p^2H^2. \end{aligned}\right\} \quad (9)$$

was solved graphically. The following values were obtained for the relative Hall mobilities of the light and heavy carriers:
$H = 0$: $\mu_{nHall}/\bar{\mu}_p = 0.94$; $\bar{\mu}_{pHall}/\bar{\mu}_p = 1.94$. $H = 3{,}000$ oe : $\mu_{1Hall}/\mu_1 = 1.03$; $\mu_{2Hall}/\mu_2 = 1.19$; $\bar{\mu}_{pHall}/\bar{\mu}_p = 1.76$. In general, different values were obtained for Hall mobility and drift mobility and if the mean free path of

Card 3/[illegible]

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

the carriers was independent of velocity their ratio was 1.18 for light and 0.94 for heavy holes. Finally, the authors thank Yu. I. Gorkun for discussions. There are 6 figures and 14 references: 8 Soviet and 6 non-Soviet. The three most recent references to English-language publications read as follows: E. Conwell. Proc. IRE, 46, No. 6, 1958, B. Abeles a. S. Meiboom. Phys. Rev., 95, 31, 1954. M. Prince. Phys. Rev., 92, 681, 1953.

ASSOCIATION: Kiyevskiy gosudarstvennyy universitet im. T. G. Shevchenko (Kiyev State University imeni T. G. Shevchenko)

SUBMITTED: April 5, 1961

Legend to Fig. 1: a) arrangement for measuring μ'_{px} b) for measuring μ'_{py}; C.W.-light line; K - collector

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

28437
S/185/61/006/002/009/020
D210/D304

24,7700
26.2421

AUTHORS: Lyashenko, V.I., and Skubenko, A.F.

TITLE: Increase of electrical conductivity of antimony sulphide with time

PERIODICAL: Ukrayins'kyy fizychnyy zhurnal, v. 6, no. 2, 1961, 202 - 206

TEXT: The relatively infrequent phenomenon of increase in the conductivity of semiconductors is largely unexplained. In this article the authors describe an experimental study made on antimony sulphide which has a conductivity rise time of a few hours. The measurements were carried out on single crystals, the crystallinity being verified by X-ray analysis. The electrodes were made by vacuum deposition of gold and the current was measured using an electrometer, or occasionally, a sensitive mirror galvanometer. Measurements were made over a voltage range of 10 to 80 V and a temperature range of 30 to 80°C. It was found that the increase in

Card 1/4

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

Increase of electrical ...

time and the ultimate current depend on the applied potential. There is a critical potential below which no rise occurs, and at 10 V there was a fall in current with time. This behavior is shown clearly in Fig. 2, where a potential of 10 V (2.3 V/cm) was applied for 77 minutes and then switched off. The direction of current flow was instantly reversed, the magnitude falling off slowly to zero. Increase in temperature resulted in higher maximum current and a faster rise time, and the current increase $\Delta\sigma$ was found to obey the relation $\Delta\sigma_{max} = \Delta\sigma_0 \exp(-\Delta U/kT)$ the activation energy being constant ($\Delta U = 0.48$ eV) for different applied potentials and samples of different purity. The rate of increase of $\ln(\Delta\sigma_{max} - \Delta\sigma)$ with time was found to be linear, indicating an exponential law. Some typical time constants are: $\tau_0 = 13.4$ min for 80°C, 80 V; $\tau_0 = 63.9$ min for 50°C, 50 V and for 50°C, 80 V. Measurements carried out under vacuum and in air showed no difference. There was no rise of current with time using alternating current and the cur-

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

Increase of electrical ...

rent increase was smaller for purer samples. In order to explain these phenomena the authors discarded any possibility of temperature rise or p - n transitions with a channel effect. Such current increase could be caused by growth of dendrites as is observed for copper sulphide; however, this was not the case as no difference was observed in current rise across and along a long crystal after prolonged passage of current. The authors, therefore, concluded that the observed phenomenon must be due to an increase of current carriers. This can be explained by an increase in the concentration of holes on electrolysis of impurities if these impurities are centers of attachment for the holes. If these impurities were discharged on the electrodes, then on removal of the potential their rediffusion would be very slow, however, these impurities are not discharged then the internal potential will revert them in the same order of time as they were oriented which is the observed case. Undischarged ion impurities create also a space charge which has been verified experimentally by measuring the potential along the sample before the passage of current and after a long passage

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

Increase of electrical ...

of current. The authors feel that the ion space charge near the electrodes may also form something similar to the end effect observed on cadmium sulphide. A more accurate mechanism and the nature of the impurities will be given in a future publication. There are 5 figures and 4 Soviet-bloc references.

ASSOCIATION: Instytut fizyky AN URSR, Kyyivs'kyy derzhavnyy universitet im. T.H. Shevchenka (Physics Institute AS Ukr SSR, State University of Kiyev im. T.H. Shevchenko)

SUBMITTED: June 30, 1960

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

DOBROVOL'SKIY, V.N.; LYASHENKO, V.I.

Determining the diffusion coefficient of current carriers.
Prib. i tekh.eksp. 6 no.4:118-123 Jl-Ag '61. (MIRA 14:9)

1. Kiyevskiy gosudarstvennyy universitet.
(Electric fields--Measurement)

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

24.7700(1043,1055,1144,1035) S/185/61/006/005/009/019
D274/D303

AUTHORS: Brodovyy, V.A., and Lyashenko, V.I.

TITLE: Preparation and electrical properties of Sb_2S_3 and Sb_2Te_3 single-crystals

PERIODICAL: Ukrayins'kyy fizychnyy zhurnal, v. 6, no. 5, 1961, 664 - 672

TEXT: The electrical properties of Sb_2S_3 and Sb_2Te_3 are investigated. First, details are given on the structure of these crystals (the data are taken from the references). The original materials were Sb, Te and S of high purity, in proportion: Sb - 99.98 %, Te - 99.9 %. The sulfur underwent additional purification in a vacuum. The substanceswere melted in a furnace. Then the specimens underwent zone melting. The purification of volatile materials by zone melting gives rise to certain difficulties. These were overcome by using an auxiliary furnace with a lower temperature. In the case of Sb_2Te_3, however, zone melting was not effective; it was used only

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

Preparation and electrical ...

for growing the crystals. After the zone melting, the specimens were polished and etched. As contacts, various metals were investigated: Cd, Tn, Pt, Ni, Au, etc. For Sb_2S_3, gold and aquadag turned out to be most suitable as contacts, whereas Wood's alloy and pure tin were used for Sb_2Te_3. For measuring conductivity, the Hall constant and the thermal e.m.f., the ordinary compensation circuit was used, with some modifications (dependening on the resistivity of the specimens). The resistivity of Sb_2S_3 was found to be $1.8 \cdot 10^7$ ohm·cm. All the specimens had p-type conductivity. For Sb_2S_3, the width of the forbidden gap was 1.59 ev. This result agrees with the results of other investigators. The forbidden gap has acceptor levels with an energy of 0.55 ev. The activation energy, calculated from optical absorption measurements, exceeds the energy of thermal fluctuations by 0.16 ev.; this discrepancy may be due to ionic lattices. For Sb_2Te_3, the following results were obtained: Conductivity $\sigma = 0.99 \cdot 10^{[illegible]}$ ohm^{-1}cm^{-1}; carrier concentration $n_p = 2.3 \cdot 10^{20}$cm^{-3}; mobility U = 269 cm^2/v·sec; coefficient of thermal e.m.f. α = 81.2 microvolt/deg. All the specimens had p-type conductivity which is

Card 2/4

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

Preparation and electrical ...

due to excess Sb. For a temperature range of -150 to +150°C, the concentration is temperature independent. The Hall mobility decreases with increasing temperature. A more detailed investigation of the temperature dependence of the mobility showed that this dependence is determined by the variable intensity of thermal fluctuations only. The high carrier-concentration and the relatively low α are an indication that the electron gas has a high degree of degeneracy. It is noted that, notwithstanding the considerable acceptor concentration, no noticeable scattering of carriers by ionized impurities was observed. In the case of carriers of same sign and absence of degeneracy, α is expressed by

$$\alpha = \pm \frac{k}{e} \left[(r + 2) + \ln \frac{2(2\pi m^* kT)^{3/2}}{h^3 n_p} \right] . \qquad (2)$$

Hence it follows that if n_p and the effective mass are temperature independent, α (ln T) should be a straight line with inclination $3k/2e = 129$ microvolt/deg. A comparison of theoretical- and experimental values showed that formula (2) is satisfactory. Further,

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

Preparation and electrical ...

it is shown that the effective mass of the carriers is temperature independent. There are 6 figures and 16 references: 10 Soviet-bloc and 6 non-Soviet-bloc. The references to the 4 most recent English-language publications read as follows: T.C. Harman, B. Paris, S.E. Miller, H.L. Georing, J. Phys. Chem. Solids, 2, 181-190, 1957; J. Black, E. Conwell, L. Seigle, C. Spenger, J. Phys. Chem. Solids, 2, 240-251, 1951; H. Beneshe, C.R. Acad. Sci., 247, 5, 584-587, 1958; S. Forgue, R. Goodrich, and A. Cope, RCA Rev., 12, 27, 1951, 335.

ASSOCIATION: Kyyivs'kyy derzhavnyy universytet im. T.H. Shevchenko (Kyyiv State University im. T.H. Shevchenko)

SUBMITTED: February 27, 1961

Card 4/4

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

30333
S/185/61/006/005/010/019
D274/D 303

24.7700 (1043, 1055, 1144, 1035)

AUTHORS: Brodovyy, V.A., and Lyashenko, V.I.

TITLE: Preparation, structure and electrical properties of the system Sb_2S_3-Sb_2Te_3

PERIODICAL: Ukrayins'kyy fizychnyy zhurnal, v. 6, no. 5, 1961, 675 - 681

TEXT: The three-component system Sb_2S_3-Sb_2Te_3 is considered, whose constituents were studied by the authors (Ref. 1: Ukr.fiz.zh. 6, 5, 1961, pp.664-672). The synthesis took place in quartz containers, in a vacuum of 10^{-4} mmHg. Eleven different alloys were prepared, whose constituent-percentages are listed in a table. Alloys 1-4 and 11 were coarsegrained; all the others were fine-grained. A microhardness investigation showed that the alloys were homogeneous. Conductivity, the Hall effect, etc., were investigated on specimens with dimensions 12 x 3 x 1 mm. The contacts were made of gold. The measurements were carried out in a vacuum of 10^{-4} mm Hg. By increa-

Card 1/3

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

Preparation, structure and ...

sing the percentage of Sb_2Te_3, the resistivity of the specimens varies from $\rho \approx 10^7$ ohm·cm (which corresponds to pure Sb_2S_3) to $\rho = 10^{-4}$ ohm·cm (for pure Sb_2Te_3). Figures and tables show the results of measurements for specimens of one lot. All the specimens had p-type conductivity. Specimens 4-6 (containing 3, 5, and 7 % Sb_2Te_3, respectively) were characterized by exponential temperature-dependence of mobility:

$$U = Ce^{\frac{B}{T}}, \qquad (1)$$

where B can be readily calculated from $\ln U = f(1/T)$. The values of C and B are listed in a table. A comparison of theoretical and experimental values showed good agreement. The assumption was confirmed that the carriers are scattered by the ionic lattice of Sb_2S_3, deformed by the presence of Te-atoms. The conductivity σ decreases on heating of the above three specimens. For the specimens 7,8,9 and 10, the carrier concentration n remained constant and is not temperature dependent. The temperature dependence of the mobility is approximated by the function T^{-a} ($U \sim T^{-a}$); this differs from the exponential law for the previous specimens. Hence the mechanism of

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

carrier scattering varies as a function of system composition. Further, specimen 11 (35 % Sb_2S_3 and 65 % Sb_2Te_3) was investigated. At temperature below 90°C, the approximation $U \sim T^{-1.05}$ holds, whereas at higher temperatures, $U \sim T^{-1.76}$. From figures which show the dependence of σ, of the activation energy ΔE, and of the carrier concentration n_p, on system composition, it is evident that n_p and σ increase with Te content; ΔE decreases, whereby the corresponding curve is practically a mirror image of the conductivity curve; the mobility increases. X-ray and microhardness investigations of the constituents show that solid solutions are formed in the system under consideration. By varying system composition, various semiconductor materials are obtained, with σ varying from 10^{-7} to 10^4 ohm^{-1}·cm^{-1}; thereby the activation energy decreases from 1.64 to 0 ev. The scattering mechanism of carriers, too, is a function of system composition. There are 10 figures, 3 tables and 2 Soviet-bloc references.

ASSOCIATION: Kyyivs'kyy derzhavnyy universytet im. T.H. Shevchenka (Kyyiv State University im. T.H. Shevchenko)

SUBMITTED: March 1, 1961

Card 3/3

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

LYASHENKO, V.I. [Liashenko, V.I.]; SERBA, A.A. [Serba, O.A.]; STEPKO, I.I.

Effect of an electric field on sorption processes on a germanium surface. Dop. AN URSR no.3:350-353 '62. (MIRA 15:5)

1. Institut poluprovodnikov AN USSR. Predstavleno akademikom AN USSR V.Ye.Lashkarevym [Lashkar"ov, V.IE.].
(Desorption) (Germanium) (Electric fields)

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

39959
S/181/62/004/008/001/041
B125/B104

24,2000

AUTHORS: Litovchenko, V. G., and Lyashenko, V. I.

TITLE: Adhesion of non-equilibrium carriers on the surface of germanium

PERIODICAL: Fizika tverdogo tela, v. 4, no. 8, 1962, 1985-1993

TEXT: The temperature dependence of the relaxation of photoconductivity of thin germanium specimens was investigated. The adhesion of minority carriers was proved by the following results: (1) The filling of the traps with carriers produced by a constant light of high intensity excludes the recombination mechanism of the relaxation of photoconductivity at low temperatures. (2) The carriers produced by the pulse itself fill the traps completely. At 200°K the relaxation curve is exponential when γ_{inj} is small, but becomes less exponential with increasing γ_{inj}. (3) With weak signals and low trap concentrations the mobile pairs responsible for photoconductivity are extracted from the specimen by a sufficiently strong longitudinal electric field. In the presence of carriers adhering to the

4

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"

"APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8

surface, the excited carriers near the adhesion center are localized and cannot be extracted. (4) If injection is achieved by a rectifying contact, the relaxation of non-equilibrium conductivity has a long-wave component at very small γ_{inj} and low temperatures. This component is destroyed by weak illumination. (5) If pairs are injected into well-developed inverse or accumulation layers, long-lasting relaxation is observed at small γ_{inj} and low temperatures. (6) Long-lasting relaxation occurs primarily in the case of n-type conductivity. Further experiments indicate the occurrence of carriers on the surface, and not inside the germanium specimen. Adhesion of carriers of one sign on the surface automatically excludes carriers of the other sign from carrier conduction in the interior, and the free carriers will move only parallel to and in the vicinity of the surface. Adhesion occurs at temperatures which are the higher the thinner the specimen. The lifetime of free electrons adhering to the surface is given by

$$\tau_n = \frac{e^{U_B - E_{tt}}}{C_n v n_0} \frac{1 - f_n}{\frac{N_{tt}}{2n_i L} \frac{F}{\operatorname{sh} U_s - \operatorname{sh} U_B} + \frac{1 + \exp(E_{tt} - Y_s - U_B)}{f_n^{-1}}}. \qquad (2)$$

Card 2/3

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031110006-8"